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IN THE

TENASSERIM PROVINCES.

1837—38

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I.

PHYSICAL AND GEOLOGICAL STRUCTURE

OF THE

COUNTRY.

THE general appearance of the British Province of Amherst is that of a plain of alluvial soil, intersected by numerous rivers and creeks, enclosed by a belt of primitive mountains, forming a semicircle from the north bending towards the east; to the west separated by the Salween river from the Burmah territory of Martaban, and partly encompassed by the sea.

General appearance. Plains.

This great plain however is not uninterrupted but diversified by a double system of hills.

Diversified by.

1. Blue mountain limestone rocks, which emerge without any further indication abruptly, and form in many parts a much broken narrow chain; in others separated hills and mounts of inconsiderable height and breadth.

Blue mountain limestone rocks.

2. A system of sandstone hills attaining a moderate height of from 2 to 800 feet, running chiefly in a direction from N. N. W. to S. S. E. The country close to these sandstone hill chains is moderately elevated and forms narrow vallies and ravines.

Sandstone hills.

They appear throughout to be isolated rather than contiguous, and alternate in many parts regularly with the blue limestone, leaving large tracts of alluvial soil between them. The highest part are the Buffaloe Mountains to the N. E.; from Maulmain distance about 70 miles, a chain attaining 1,543 feet at its highest part.

Form. Height.

A great part of this sandstone formation is distinguished by rendering the soil round about barren and unproductive, the spontaneously growing vegetation being scanty and confined to some peculiar stunted trees and a kind of dwarfish bamboo.

Sandstone mountains—barren.

In almost all the parts the sandstone reposes upon clay slate, and the sandstone is every where impregnated with more or less iron ore, besides veins of quartz, sometimes constituting part of the rock.

Repose upon clay slate.

Limestone mountains.

Approaching the great range of boundary mountains the formations become different.

Formation.

They are almost entirely confined to primitive rocks, amongst which mica slate is the most common—2, Gneiss much more seldom and only in the higher parts—3, Granite, which I found in one place only in the whole territory which I traversed. This is a very coarse grained variety with prominent felspar.

Height.

The highest part of these primitive mountains is about 5,300 feet high; it is an almost uninterrupted range with very few passes of uniform slightly undulatory aspect, with some prominent obtuse conical peaks and crests, resembling volcanic craters in aspect but in reality totally different.

A continuation of the great Himmalaya range.

Double distribution.

This may be properly called the continuation of the great Himmalaya system; which, in the eastern extremity of Bhootan separates in two branches running in a N. E. direction towards the Chinese Province of Yunan, the other taking a S. E. course running through the Shan countries, and dividing them. This second branch after having reached the 101st degree of longitude, and 17th degree of northern latitude, points at once directly to the south, divides Siam from the British Provinces of Tenasserim, and at the 10th degree of latitude the Peninsula Malacca in almost two equal parts, till it loses itself near the equator, in the Island of Singapore.

Plains covered by the sea.

At a recent period.

There is no doubt that at a period not very distant the fertile plains of Amherst Province were covered by the sea, which receded only probably after the very last revolution which our globe underwent.

The rugged broken limestone rocks with their manifold caves (now devoted to Buddhistrial worship) the fragments of rolled stones, at the base of these mountains, but chiefly the quantity of saline matter with which the soil is impregnated, to this day are ample proofs of it.

Present changes.

The country is constantly undergoing changes in the alluvial plains, chiefly by the formation of new nullahs.

In the plains.

The water which covers them during the monsoon, collects in inland lakes after the rivers begin to retire in their ordinary beds. Then it breaks often through the soft ground, opening new channels towards the river. These changes of nullah beds happen every year, and waste a great deal of good land, chiefly because human ingenuity does nothing to direct or facilitate a natural return of these waters.

Consequence of the annual inundation.

A great portion of these waters remain however stagnant in inland lakes; it evaporates partly by degrees during the dry season, but in many parts gives only an ample opportunity to the formation of morasses and consequently to the generation of malaria. Vast tracts of these plains are by this rendered uninhabitable and pernicious, and serve only as an inaccessible refuge of numerous

wild beasts, thousands of acres of which, with very little care, could be drained and rendered the most productive soil.

But this probably will not be effected in our days, where the best part of the country lays unoccupied on account of a want of population. The soil itself is almost throughout of the best description, and adapted to all kinds of tropical cultivation. Fertility of the soil.

The few exceptions were soil is comparatively unproductive are the following: Exceptions.

(a) Low lands exposed to the pernicious influence of the sea water.

(b) The marshes in the great plains between the Salween, Gyne and Attaran rivers.

(c) The barren sides of the sandstone hills and the intervening valleys disposed throughout the Province.

(d) The limestone rocks (though the chasms and valleys between them are exceedingly productive.)

(e) Part of the primitive mountains forming this northern and eastern boundary.

The paddy lands occupy a great area, perhaps a third part of the whole country, and afford the means to maintain a vast population much more, as a failure of the crops is almost unknown on account of the regularity with which the annual inundations take place and last a certain time. Paddy lands.

The higher situated plains contain the best soil. The constant decomposition of vegetable matter has in many places accumulated the humus upwards of three feet deep. Equally fertile are the valleys in the north, chiefly a great valley between the primitive northern range, and another secondary to the south upwards of 80 miles long by from 2 to 15 miles broad, now totally uninhabited and overgrown with forests. This valley besides has the advantage of being intersected by numerous creeks descending from the high mountains, and affording the greatest facilities for irrigation if required. Higher situated plains.

This beautiful country possesses the faculty to maintain many millions of people (the total population of Amherst Province is about 45,000); to raise the greatest part of the valuable productions of the east, and to prove a most profitable part of the British possessions, without taking for the present into consideration its natural (spontaneously) growing productions, its excellent position, and the great mercantile advantages which the Burmah territories in general must attain at a future epoch as an outpost of the great Chinese terra incognita. Value of the Province.

RIVERS. The Province of Amherst is intersected by many navigable rivers and creeks, of which the Salween, Gyne and Attaran and its dependencies, are the most important.

Salween. The Salween is the first, considering the length of its course. Flowing directly from the north through countries hardly known by name, coming from a source never visited by Europeans, it enters the British possessions at the confluence of the river Thon-khan.

Entering the British possessions. There it is obliged to force its way through an accumulation of mountains which separate the extensive valleys to the north, and in general the sub-alpine country of the Shans from the plains of the British possessions.

Rapids. The bed of the Salween here contracts so much that its breadth occupies not more than thirty yards in some places. Ten miles below the entrance of the Thon-khan river in the Salween are the great cataracts or rapids which totally interrupt the navigation. Ten miles lower down is a second rapid, but of little consequence, so that boats can pass over it during the dry season.

The third obstruction of the river is between the mainland and the island of Kauloon where only the eastern channel is passable at low water, the western having at the northern point of the island a bar stretching across.

Navigation. From this place the navigation is uninterrupted all the rest of its course.

The Burmah canoes generally ascend only as far as the mouth of the Yengbaing river on account of the current in the higher parts, varying from 5 to 7 knots, and the frequent eddies, which in many parts are considered as dangerous.

[N. B. I contrived to ascend 17 miles above the mouth of the Yengbaing, when the current became so rapid that the boats proved unmanageable.]

Dr. Richardson reports that the river above the rapids is navigable so far as the town of Monay.

Effects of the periodical inundation in the mountain pass. In this mountain pass the depth of the river is very considerable, varying from 4 to 8 fathoms and upwards. During the rainy season, the impetus of the water forcing its way through this pass must be awful. In some places the river rises more than 40 feet and desolates the banks. The height which it then attains is marked by vast deposits of shingle and loose sand, forming extensive beds amongst the rocks.

Country through which the Salween flows. Six miles below the confluence of the Yengbaing with the Salween, the river enters a more open country, and below the island of Kauloon it may be said to have entered the plains; on both sides however the characteristic mountain limestone rocks approach the river several times, and once more so close that the river

is obliged to force its passage through one of their ranges at Zoag-ka-beng, 25 miles above Maulmain. Below Kow-loon-Kioun, the ordinary breadth of the river may be in the average half a mile, augmenting after the river has passed the Zoag-ka-beng range.

The depth of the main channel continues to be from 2 or 3 fathoms, 35 miles above Maulmain, but in two places I observed a ridge of rocks stretching across the river underneath the water, which seems to impede the navigation for vessels of any considerable burden. Depth.

The Gyne river is the second in importance. It is formed by the confluence of the Thlaing-boay and Dagyaing. *Gyne river.*

The Thlaing-boay takes its origin in a chain of mountains composed of sandstone and clay slate, situated between the Pakah range and the Elephant Tail mountains, by the confluence of three small creeks, receiving numerous additions in their course from W. by N. to E. by S. The greatest part of these rivulets are however completely dry during the fine season. The Thlaing-boay enters very soon the plains, between the Gyne and Salween, and becomes then a slow running tortuous river. It is navigable for Burmah boats, as far as the Karean village of Panyeing, 10 miles above the village of Thlaing-boay, where it was in the month of April 12 feet broad and 2 to 4 deep. *The Thlaing-boay.*

The Dagyaing river is more considerable. It is formed by numerous creeks descending from the great Siamese frontier mountains. These unite in three separate creeks, one running through a fertile valley from the N. W. the second (being the most considerable) from the N. E. and the third joining the two others after that junction coming directly from the east. *Dagyaing river.*

The united Dagyaing is for a considerable distance not navigable, being then an impetuous torrent, whose course is continually obstructed by detached rocks. The highest part, where small Burmah canoes drawing less than 1½ feet water, can ascend, is the village of Konoh, but even these small craft must frequently be raised over the several barriers stretching across the stream. Navigable for canoes.

The navigation for common Burmah boats begins at the village of Painn-kioum-yua, where the river is from 40 to 60 feet broad, with a depth from 5 to 12 feet. After a very tortuous course of 20 miles, it unites with the Thlaing-boay, retaining however the name of Dagyaing as far as the village of Gyne.

At its confluence with the Thlaing-boay it is already a considerable stream measuring ¼ mile in breadth, rapidly pursuing its course, as numerous rivulets coming from the eastern boundary mountains join it. Confluence with the Thlaing-boay.

At the village of Gyne it is considerably increased by another large stream, the Hondrow river. It assumes then the name of Gyne, and varies in breadth from ¼ to ½ mile. The Gyne would be navigable for vessels of some

Navigation interrupted by a bar.

burden, probably as high up as the conflux of the Dagyaing with the Thlaing-boay, were it not interrupted by a large sand bank, forming a bar across the whole river 2 miles below the village of Gyne.

Even Burmah boats cannot pass this place at low water, but are obliged to wait for the tide. It unites finally with the Salween before Maulmain.

Attaran river.

The third river in importance is the Attaran, coming from the S. S. E. This river is less broad than the others, but the deepest, and may be navigable for deep laden craft to a considerable distance.

Navigation.

I had no opportunity of examining it high up, Mr. Crawfurd sailed in a steam vessel as far up as the site of the town of Attaran.

Maulmain river.

It joins the Gyne and the Salween at Maulmain, the three united rivers forming then the majestic Martaban or Maulmain river, which enters the sea by two openings divided by the large Island of Bilukioun.

Mass of water.

The number of secondary streams descending chiefly from the great boundary range to the N. N. E. and E. render it explicable that such a stupendous mass of water as forms the Martaban or Maulmain river accumulates between Martaban and Maulmain. It has the appearance of an inland lake more than 6 miles in length, presenting a beautiful sheet of water, which as Mr. Crawfurd truly says, contributes to form the most striking scenery any tropical country can boast of.

Secondary streams.

Amongst the streams of the second class, the Yeng-baing, the Thou-khan and the Houndrow are the first.

Yeng-baing river.

The Yeng-baing is merely a rivulet at low water, at its mouth not more than 20 feet broad, but remarkable on that account, being the only stream which flows from the east to the west, in that part of the country, which forms a kind of Peninsula inclosed between the Salween and the Gyne. It is further remarkable that it forms the only accessible road into the interior, and is the only part inhabited by Kareans, all the rest to the north of the country from the Yeng-baing to the Thou-khan river, (an accumulation of mountains and intervenient vallies) being totally destitute of population.

Thou-khan river.

The Thou-khan is an impetuous mountain torrent, forming the northern boundary of the British possessions, flowing in an E. S. E. direction into the Salween.

Channel for transporting pine trees.

This stream will be perhaps in time of some importance, promising to prove at high water a good channel to convey teak but chiefly pine trees into the Salween, and from thence to the south.

N. B. The countries to the north of the Thou-khan abound in pine trees, according to the authorities of Dr. Richardson and Captain McLeod. This

valuable timber for mast pieces is no where else to be found but on that high plateau which rises in succession, when approaching the unknown regions between the British possessions and Chinese Yunan.

Houndrow river.

Another stream of some importance is the Houndrow river coming from E. S. E. from the Siamese mountains, and discharging its waters into the Gyne. At its junction with the latter stream it is 350 feet broad and between 1 to 3 fathoms deep.

Its importance.

It is important as forming a commodious road a great distance towards Siam, and as the means to carry to the capital, teak and other valuable timber, to be found abundantly on the banks in its higher parts. All these streams (without one exception) unite in one mass as already mentioned before Maulmain.

Annual inundations.

During the months of July, August and September, when the rains swell these rivers, comprising an area of many hundred square miles, is covered with water, which inundation is the great source of fertility in general, and productiveness of the paddy fields especially.

Regularity of the inundation.

It is remarkable that the rise and fall of the water follows with a certain immutable regularity, and that the water once decreasing never attains its former height during the season.

This seems to me a proof that the rise of the chief river (the Salween) depends entirely upon the periodical rains, and is not caused by the melting of snow, which leads to the conclusion, that the unknown source of the Salween is not to be traced in any part of the great chain (supposed a continuation of the Himmalayas) attaining a considerable height.

Facility of communication by water.

Commanding such a number of navigable rivers, the country possesses the means of communication very seldom to be found in other parts.

In fact boats are the only means of conveyance throughout the country, and excepting some wandering Karean tribes (inhabitants of the mountains) every village and hamlet is built either on a river or a creek.

The whole extent of paddy-lands (one-third of the area) is intersected by nullahs going 10 to 20 miles inland, many at low water being dry, but navigable with the rise of the tide, thus affording facilities, which render land carriage almost superfluous.

Channels uniting this country with Pegu as far as Bassein.

Besides this the country to the westward of Salween is intersected by a network of channels. Above Martaban 12 to 13 miles is the Kadashoang creek, which leads during the monsoon to Rangoon through the Sittang river, and from thence again through several channels to Bassein, a direct distance of more than 200 miles.

Mr. Crawfurd's opinion therefore, that the internal navigation of Pegu possesses natural facilities far beyond any other Asiatic country, seems by this to be fully corroborated.

II.

MINERALOGICAL PRODUCTIONS.

Limestone. ONE of the most striking features of this country exhibits the carboniferous limestone, mountain limestone, corresponding exactly in every essential point with that found under that denomination in England, North of France and Belgium.

It rises in many localities above the plains at once to a considerable height, that range known under the name of Zoag-karbeng, attaining an altitude of 2136 feet.

The inclination of its strata is chiefly discernable from the fissures in the rock, and throughout its merits the geological denomination of mural.

Origin. It seems certain that all this formation was by some great convulsion of nature upheaved at once. The scattered and rugged divisions with vertical or mural precipices (sometimes 5 to 800 feet high) their caverns, the detached rocks at their bases, &c. amply designate the desolating powers of one of the great revolutions, proving at the same time that perhaps at a not very remote period, the ocean washed their foot.

Superior lime. These limestone chains furnish a very superior lime, (now used in Maulmain) and it is a question if it would not be preferable to transport lime from this province to Calcutta and other parts of India, instead of that procured now from Silhet.

The limestone generally is of a blueish grey colour, fracture fine and granulated, and translucent on the edges, but in many parts it is white, yellow or red, varying in the intensity of shade, and affords in several situations very good marble.

Marble.

Exportation of marble. As marble in India is at present greatly appreciated, with difficulty obtained, and very costly, it seems that marble could be exported from here with advantage. The expense, except for stone saws, would be inconsiderable. Chinese accustomed to work in quarries could be got at Singapore, and the land carriage in the best localities does not exceed one or two miles from the navigable Salween.

Metals in limestone. All the separated ranges merit to be attentively examined on account of the ores which they probably contain. The same formation has obtained the name

of metalliferous limestone in consequence of the quantity of lead ore obtained from it in the central and northern parts of England, but chiefly at Bleiberg in Illyria.

Iron.

Iron is the most common mineral dispersed throughout the province. If we except the alluvial plains between the Salween, Gyne and Attaran, the upheavings of the limestone rocks scattered in the plains and the great chain of primitive mountains composed of gneiss, granitic, mica, slate and porphyry, scarcely any other part of the country will be found where iron does not appear in one or the other form.

The state however in which it occurs varies greatly in different localities.

It occurs—

In beds.
In veins (as iron pyrites.)
Included in rocks (entering the composition of massive rocks.)
Disseminated as secular iron ore.

I. Locality on the Salween.

One of the most interesting beds of iron ore isolated occurring is on the banks of the river Salween, four miles above the mouth of the river Yengbaing on its left side.

There the river flows through a deep narrow rapid channel forced through a valley on both sides crowned with 6 to 1200 feet high mountains. The formation is blue limestone in its transition into mica slate, i. e. the limestone has a slaty fracture and is very dark, (in some places it becomes even difficult to determine if it is limestone or argillaceous schist, with which it is perfectly blended, but nitric acid dropped on the rock producing an effervescence gives the best criterion of limestone.)

Rocks in the vicinity.

About a mile above the mouth of the Yengbaing some blocks of siliceous rock change the monotony of the formation. A mile further up these blocks become larger and more frequent, and small veins of porphyritic felspar intersect the slaty limestone. The first appearance of iron becomes conspicuous, but it is confined to disseminated iron pyrites, and the waters running in small brooks from the hills are tinged with iron ochre.

The iron bed itself.

The above mentioned isolated mass of iron ore is about 50 yards broad and 15 yards protruding into the river. How deep it extends could of course not be ascertained; the irregular shape of the mass did not permit of any strata or inclination being distinguished: on all sides it is encompassed by the same slaty limestone just described.

Mineralogical composition.

The ore belongs to the division of brown iron stone, containing in a hundred parts of oxyde of iron about 75, silica 10, and the rest water, &c. and promises to yield about 50 per cent. of good bar iron.

II. Locality.
Iron ore between the Salween and Gyne in the sandstone formation.

Following about 30 miles the course of the river Yengbaing from the Salween towards the N. E., a succession of hills varying from 40 to 200 feet in height must be crossed, composed of sandstone, a formation very common throughout the province and every where bearing the signs of the presence of iron.

Iron appears in this formation under the following species and varieties:—

1. Bed iron froth.
2. Red ochre.
3. Red clay iron stone.
4. Compact red iron ore.
5. Hœmatite.

The same formation prevails in the neighbourhood of Maulmain, extending to Amherst and from thence towards Ye, until the sandstone meets the granite, which puts a stop to the occurrence of iron, and the same varieties occur there, but no where rich enough to be an inducement to work them.

I did not visit the country to the south, but from a place one day's journey to the south of Amherst some iron ore was brought to me which was a beautiful conchoidal bog iron. It occurs there abundantly and merits to be noted down as a locality for the future.

To this class belong the iron impregnated sandstone conglomerate. It includes sometimes isolated masses of conchoidal meadow iron ore, of which no doubt extensive beds exist in different localities.

III. Locality.
Iron ores in the Gyne.

The best localities for the extraction of iron ore are in the Gyne river and Dagyaing in its higher part.

(a) Close to the village of Painkhium, 300 yards from the Dagyaing, where an extensive bed of brown iron stone occurs.

(b) On the right side of the Gyne river opposite the Talain village of Dolan, a chain of small hills about 100 feet high rises above the extensive rice plains in a direction from S. E. to N. W. These hills abound in iron. The best locality however in the whole chain is a small hillock rising not more than 20 feet above the plain, containing a very superior magnetic iron ore of a blueish black colour, in blunt edged rolled pieces bedded in a yellow clay.

(c) On the right side of the Gyne river near the village of Gyne, four miles inland to the W. the same form as *(b)* but not so rich.

Granular magnetic iron ore carried down by the water is very common in the ravines, in pieces varying from the size of a pigeon's egg to the minuteness of the finest sand.

IV. Iron from the island of Bilukioun.

Another form of iron occurs in the island of Bilukioun opposite to Maulmain, on a hill composed of red iron clay reposing upon granwacke, which is pecular

iron ore or (iron glance, fer oliqiste) in chrystals whose primitive form is a rhomboid or double three sided pyramid.

It occurs disseminated and appears rather scarce. To complete the enumeration of iron as it occurs in this province, I must mention the iron pyrites which are very common on the Salween in mica slate and other primitive rocks, sometimes occurring in considerable veins.

N. B.—This is the metal which the Burmese estimate as very valuable, though it is intrinsically entirely useless, probably on account of its bronze yellow colour, as they pretend it may be transformed into gold.

The Kareans find pieces of the same pyrites frequently in the beds of brooks, and keep them very carefully as talismans against diseases.

Though iron ore at present is no where dug by the Burmese, there are in many places remains not only of opened pits, but also (not far off generally) of smelting furnaces; altogether on places now totally overgrown with high forests destitute of population.

The remains of old iron pits and smelting places.

One of these most considerable smelting places must have been on the Gyne opposite to the village of Dolan, where the ruins of a considerable town, with numerous pagodas, can be traced; on one place the vitrous residua of the iron stones may amount to more than a hundred tons forming a small hill on the plain.

Localities.

A second considerable smelting place must have been not far from the present village of Coe-byne, and four miles inland a third; besides several others in the higher part of the country on the Dagyaing.

The smelting process however must have been very rude, some of the vitrious flux which I examined containing still 15 or 20 per cent. of iron. Sometimes the ore was so imperfectly fused that the pieces when broken exhibited the iron in metallic grains inclosed in the middle of the stone. The natives seem to have employed large pots, and probably were totally unacquainted with blazing furnaces. Numerous fragments of such vessels scattered about at least led to the first supposition.

Burmese method.

With respect to the advantages which could be reaped from the working of those iron pits they appear doubtful for the present.

Question if it would be profitable to work the iron mines at present.

The best places are situated near navigable rivers, the greatest distance being four miles.

Advantages.

The iron bed of the Salween is immediately on its banks; the iron on the Dagyaing scarcely 1,000 yards distant; the iron at Dolan quite close to a navigable creek in conjunction with the Gyne.

Disadvantages. But as long as coal is not found the expense would probably exceed the profit.

It is true that wood is easily obtained in any quantity throughout the province, and it would seem that this material would answer here, as charcoal is employed with advantage in Russia, Norway, Sweden, and a great part of Germany.

But *(a)* the high price of labour in general in a province so thinly peopled;
(b) the want of inducement to the people to gain money;
(c) the extraordinary price of every trifling article of machinery;
(d) above all, the exorbitant price of freight to any part of India (25 to 30 Rupees average to Calcutta,) seems to exclude any enterprize in this respect at least for the present.

Should coal be found in a favourable place, then certainly the production of pig iron would be recommendable.

Antimony. This metal is spread throughout the province, but chiefly found in the sandstone formation; in the greatest abundance in that range of hills running from N. to S. situated between the great Maulmain river and the Attaran.

It occurs in veins of considerable thickness commonly imbedded in quartz, but frequently quite unmixed.

Hitherto, only that which lays on the surface has been regarded.

Mineralogical properties. It is Sulphuret of Antimony, soft, easily frangible, staining the hand, of a lead grey colour, massive, radiated, crystallized, in prisms very seldom in accular crystals. It emits a strong smell of sulphur.

Antimony has hitherto been considered as a metal of little value, and the supply from different parts of Europe, chiefly France, sufficient for the consumption in Great Britain.

But for some time it has been much in demand at Singapore, to which place it is brought from Borneo and eagerly purchased.

Should it prove of value, that of this province is of the best quality, and would form an excellent ballast for vessels sailing to Europe.

The cost of the extraction of the ore would be comparatively very small indeed.

Lead. I did not find this metal in its native place; but several pieces were brought to me, without indication of the place of its occurrence, which establish the fact that it is to be found in this country.

The natives are very diffident, and very seldom indicate the places where they know ores exist. The reason is that they have not yet forgotten the principles of their former rulers, with whom it is the custom, if valuable mineralogical productions are discovered somewhere, to compel the inhabitants of the neighbourhood to work the minerals to the exclusive advantage of Government. To this I owe it, that I have been almost always misled in my enquiries. It is probable that the lead occurs in the mountain limestone formation.

Prejudices of natives regarding mineralogical enquiries.

The pieces which I procured were common hexahedral galena or lead glance.

I am told it occurs in the Southern Province of Tavoy likewise.

This valuable metal, to be met with in such great abundance throughout the Indian Archipelago, in the primitive rocks ascends the Peninsula of Malacca only as far as the granite formation extends, i. e. just below Amherst, that part which I had not opportunity to visit.

Tin.

In the northern part of the Province I found this metal only once in a very remarkable locality to the N. E. of Maulmain about 110 miles distant from the capital.

An inland lake by the Kareans called Lambret, having the appearance of being placed within an immense crater (though not the slightest trace of a volcanic origin can be found), is situated at the foot of the Siamese frontier mountains. The formation of the mountains is partly gneiss and mica, partly granwacke, partly old limestone.

Remarkable occurrence.

On the western side of this lake are scattered rocks of quartz, all more or less rounded and smooth, as if exposed to the action of the water through a protracted period, and undoubtedly brought from a distant place to this valley.

All of these gigantic pebbles are more or less filled with small tinstones, each not larger than a quarter of an inch.

This is the only place where I found tin. The quantity which could be obtained is certainly so small that no practical advantage would ever be derived from them.

I did not find any copper within the British territories as far as I visited them, but some of this metal has been brought to me from the Burmah-side, coming from that part of the country which is situated opposite the British island of Kank-a-zeet, a part of which all Burmahs confess to be the richest in mineralogical productions, though entirely neglected by the Burmah Government.

Copper.

Occurrence.

The piece which I obtained and examined was a composition of copper, sulphur, arsenic and iron, probably that species which is known under the name of white copper. The colour is between yellow and white, hard and brittle, tinged with green metallistic spots, metallic glistening.

Silver.
Place of occurrence.

There is a tract of country enclosed between the Salween and Thou-khan on two sides, occupied by a ridge of mountains generally known under the name of the Pakah range. This chain of mountains begins a little above the island of Coulon, and its main range running directly from S. to N., terminates below the river of Thou-khan, sending collateral branches towards the west, which extend into the Burmah territories, and lose themselves towards the east in a plain or rather tableland intermediate between it and the great Siamese boundary range.

Description of the country.

This accumulation of mountains consists chiefly of limestone or mica slate, or of that transition already described. It is an accumulation of rugged forms, with intervenient chasms and narrow valleys thrown together apparently without any order. The highest chain attains the height of 2,500 feet.

The whole country is exceedingly wild and throughout covered with lofty forests. Though it extends 30 miles in length and 8 to 10 miles in breadth, it is entirely uninhabited. The nearest abodes are three Karean villages to the south, situated one from the other 8 to 10 miles distant, along the winding course of the Yeng-baing.

Accidental discovery through a Karean.

By accident a Karean, quite contrary to the usual apathy and indifference of his race, took interest in my pursuits, and observing that I examined all stones around, communicated to me that he knew the site of a *gold* mine and offered to conduct me to the spot. With considerable difficulty, chiefly following the dry beds of mountain torrents and proceeding along the crests of the extended mountain chain, I arrived after 1½ days march at a spot, where the abrupt forms of the limestone rocks were still more prominent. I had then crossed the main range and found myself on the northern slope. Perpendicular walls rose in all directions, narrow chasms divided the rocks, extensive caves at the bottom alternated with mighty fissures, and dilapidated fragments were strewed on the obtuse tops and laid scattered at the feet of these rocks.

An old mine.

There was indeed alongside one of these mural sections, the site of an ancient mine; it must have been worked in the rudest possible way; the quartz veins which intersected the rock were hammered out without removing the main formation. The vein had a declination of 35 degrees, and was as far as accessible searched out, and the lower part filled up again, with stones and rubbish. I removed these impediments as much as I could, and found that the vein had not been followed up underground. I contrived to get at the quartz rock and to knock out some of the metal consisting not of gold but of an ore composed of silver, antimony and copper.

A subsequent examination shewed that the ore had been probably extracted on the spot, as I found two pieces of half melted metal among the rubbish. It was impossible with the means at my command to follow the vein any further, but the existence of the ore was clearly established.

By whom worked.

It seems that this mine had been long time ago abandoned. The whole country being without population, and the savage Kareans, the only inhabitants in

the neighbourhood, perfectly ignorant of its existence. The man who brought me to the spot had the knowledge of it from his father, who was born in one of the northern Shan countries, where a tradition of the riches of this mountain called *Baindrawn* was current. The man himself said that he had visited it only once before.

It is probable that the Siamese in former ages occupied this tract of country, and that the existence of silver in this place subsequently was either unknown to the following masters the Burmese, or that they had not means and opportunity to explore them.

The re-opening would be attended with great difficulties and considerable expense. Re-opening.

(a) All provisions in the first instance must be brought from a distance of 30 miles.

(b) It would be in vain to persuade the Kareans to work, though convicts might be employed.

(c) It would be difficult and expensive to make a road through the mountains to the spot.

(d) The land-carriage is very long, the only navigable river is the Salween, which lays (at least that part below the rapids) 30 to 40 miles distant. (N. B. Above the rapids it may approach within 12 miles.)

But at present it would be presumptuous to form a decision, at any rate it seems to be advisable to have the value of the mine ascertained, and to form then a correct judgment of the outlay and return of capital.

Though coal has not yet been discovered it seems, to judge from the geological conformation, almost certain that extensive coal deposits will be found even in the neighbourhood of Maulmain. *Coal.*

The rocks of the carboniferous group, sandstone conglomerate above, then clays with ironstone and limestone (which always contain beds of coal interstratified) finally mountain limestone underneath; these are the infallible geological formations including coal basins, and it is rather to be wondered that no locality of this kind has as yet been discovered.

One of the most interesting phenomena observed in this country is the existence of subterraneous wood observed in two places. The first is in the lower part of the Dagyaing river, the second on the banks of the Gyne, 20 miles from Maulmain. *Subterraneous wood.*

As I had more opportunity to examine the first I will confine my observations to it. And locality.

Description.

The country round about is alluvial soil, a blueish grey soft clay covers the wood to the height of 15 to 20 feet. When I first saw it I thought to have discovered a coal-bed. Passing the river at the time of the lowest water I saw a horizontally lying stratum protruding into the water and found after closer inspection that it was a mass of wood of three feet thickness, and as far as I could trace it, that it occupied an area of half a mile along the river. The wood had an uniform dark brown appearance; it did not consist of one mass, but the different parts and pieces were easily separated and even the bark of several distinguished. But they lay so condensed one upon the other that it seemed as if some extraordinary power had crushed at once an entire forest, and as if a heavy load covering the trees had compressed them. The pieces were placed one upon the other, chiefly horizontally, but not without exceptions. I must observe that I did not find roots but branches of all descriptions and large trunks together.

The wood was full of moisture, and crustacea and mollusca had perforated and continued to occupy it, but the wood was perfectly well preserved: dried in the sun it burnt freely but did not keep the heat for any length of time.

I did not observe that the wood had any silicious coating, it was also not carbonized like half-fossilized trunks, from the lake of Geneva, &c., but it was just like wood immersed for a length of time in water, without undergoing any other alteration, except that it was brittle, and when dry much less compact.

When deposited.

The height of the soil covering this mass of vegetable production, with every appearance that it accumulated successively and quietly, proves that ages must have elapsed since this phenomena took place, which supposition is equally corroborated by the large forests now growing above.

Hypothesis.

It seems that the same causes which gave origin to the existence of coal-beds operated likewise here perhaps in a much more recent period, and that other reasons prevented the fossilization of the trees. What continues to keep these subterraneous forests in this state of preservation can only be an hypothesis, but it is probable that oxyde of iron contributes greatly to it. I allude to the frequency of bog iron ore in peat mosses, so familiar to the mineralogist, and add that red iron oxyde was very common in the vicinity of the place just now described.

But at any rate this accumulation of trees is different from the wood found in peat which occurs only accidentally mixed with the transformed mosses, and which causes its preservation. Here, as almost every where within the tropics, peat is unknown, and I consider that a much more powerful chemical agent must have affected these primeval forests, as within the tropics the decay of wood is much more rapid than in our cold and humid northern latitudes.

Practical explanations.

I mention this curious phenomenon in this report chiefly with the view that it may be perhaps found cheaper to dig out this great supply of wood, instead of felling timber. Only one objection is to be stated, whether it gives the same degree of heat as fresh wood?

III.

AGRICULTURE.

THE agriculture in its present state is very imperfect and just as far advanced as to satisfy the limited wants of the people. *In its present state.*

The only cultivation of importance constituting the principal source of nourishment to the people is rice. *Rice.*

It seems that all species of rice (Heyne enumerates 21 varieties grown in Mysore alone) may safely be reduced to one primitive species, which according to the country, soil, climate and season, produced by degrees so many varieties. This country affords a proof that even oryza sativa and mutica are not really different. The Kareans who cultivate rice on the slope of mountains intermix their seed from time to time with rice, which they procure from the Burmese who cultivate it exclusively in the plains under inundation. Both seem, if seen in their respective localities, to be positively different, the Burmah rice of the plains representing a superior species of the oryza sativa and the Karean mountain rice oryza mutica. But after two years the oryza sativa changes entirely into the latter, annually decreasing in height and attaining a more slender culm. The observation farther, that rice from marshy grounds perishes in situations where it gets only an accidental moisture, seems to be refuted by this observation at least with respect to this country. It may be that the violent monsoon, which pours down torrents of rain with little interruption during five months, supplies a regular and continued inundation. **Different species of rice.**

The care bestowed upon the cultivation is very trifling. The ground is in several localities neither ploughed nor harrowed. The first preparation is to burn down the dry stalks of the last year during the dry season. When the monsoon regularly sets in and has sufficiently moistened the ground, and when covered with water, buffaloes are brought into the field, and a whole herd, as many as the cultivator possesses, are driven repeatedly over the field for the purpose of treading and preparing the ground, after which the grain is sown broadcast without any other particular management. **Manner of cultivation.**

This is the whole operation, which performed, nature does the rest. There is, except in the island of Bilukioun, no transplantation, no thinning of the superfluous plants, no clearing from weeds, no artificial irrigation practised.

The time for sowing is generally the middle of June, the time of harvest from November to January. **Harvest.**

Paddy ground.

The Burmese cultivate rice without interruption on the same spot for a succession of years, in most parts without any manure, and yet the soil is never less productive. The annual inundations fertilize the country in a similar way, as the Nile does the plains of lower Egypt, by new deposits of alluvion.

Method of the Kareans.

The wandering Kareans however have much greater labour. They change their fields at least every three years, very frequently every year. The reason of it is however a national peculiarity,—a religious prejudice and not a diminution of the natural fertility of the soil. Every family works independently from the other members of the same community or sub-tribe; they remove also independently to another place within a certain circle without consulting their neighbours. When they fix upon a new spot, often a much worse situation than that which they had just left, the great labour of cutting down part of the primitive forest and to burn the withering trees is renewed.

Without any further previous operation they sow the rice amidst the stumps of the trees, it springs up with numerous weeds, but without being further looked after, it yields notwithstanding a satisfactory crop.

Qualities.

The best rice is raised on the island of Bilukioun and in the Martaban plain. It is considered rice of the very best quality, by some preferred to be the best of the Bengal rice.

Exportation.

It has become lately an article of exportation to a limited extent, it is however increasing, and promises to supersede in time the exportation from other parts of India.

It is carried from hence both to the southern parts of the Peninsula, and to the island of Mauritius.

Cotton—species.

All the cotton which is grown by the natives belongs to the annual species gossypium herbaceum.

It has been cultivated since time immemorial, but was probably in the first instance brought from India, its original native country, from which it was brought also to Syria and Egypt.

Cultivation scanty.

The cultivation is altogether scanty. The Burmese wear in general so little cloth, they procure their better garments from Ava and China, and are now overstocked with English manufactures, so that the cultivation is rather decreasing, as the raw article is all used only for home consumption and scarcely any exported to China, like that raised in the Ava Provinces.

And imperfect.

The cultivation is likewise very imperfect though more care, chiefly in eradicating the weeds, is bestowed upon the young plants than upon many other articles.

All the cotton plantations which I saw were near rivers or creeks on their sloping banks, which are inundated during the monsoon. Place.

The seeds are sown in rows in the months of November and December, and begin to bear in the months of February and March. When ripe, chiefly females go in boats, with small varnished baskets, early in the morning, to the cotton plantations to collect the ripe buds, as it is considered of advantage to gather them when full of the morning dew. Time for sowing. Method of collecting.

The method of separating the seeds is equally imperfect and it is performed entirely by manual labour. Those who sell their surplus to merchants of Maulmain do not give themselves this trouble, but sell the cotton with the seeds, a proceeding which deteriorates the article in a great measure.

The cotton is of inferior description, of very short staple, and will probably never prove a desirable article of commerce.

The use of tobacco is general amongst all classes of people and both sexes, children of two or three years not excepted. *Tobacco.*

The Burmahs use the tobacco in a double way, either smoking segars composed of tobacco leaves mixed with jaghiri or molasses, and other not essential ingredients, the whole wrapped in a green leaf or stuffed into the stalk of a kind of arundo or phragmites, or they chew the leaves alternately with betel leaf. Use of Tobacco among the Burmahs.

The Kareans, on the contrary, indulge very seldom in the refined luxury of a segar, but smoke out of small wooden pipes resembling very much those in use among the lower orders in Hungary. Among the Kareans.

To this end they cut the green tobacco leaves in small pieces, and dry them afterwards in the sun, a very bad method, which renders the tobacco exceedingly strong and coarse, by interrupting the circulation of the sap in the leaf at once, and giving opportunity to a fermentation, which renders the tobacco disgustingly acrid. But they themselves seem for this reason to be so much the more pleased with its taste. Curing.

It would be difficult to trace the introduction of this generally spread weed, which forms in these provinces not an article of luxury but of absolute necessity. It is probable that it has been brought from the west, though several authorities are of opinion that it has been introduced by the Portuguese from Malacca. Its introduction.

The tobacco cultivated is of an inferior variety of the nicotiana rustica and of a quality probably worse than any raised in India, which itself on the whole is tolerably bad with few exceptions. The Burmese never bestowed any care to obtain a better variety, probably because they are ignorant that any other exists. Species.

Method of cultivation.

They bestow however more care upon its cultivation than upon that of any other vegetable production, carefully selecting the best spots and clearing diligently the place from weeds. They prefer rich alluvial soil exposed to the full influence of the sun to any other ground. They sow the seed in nursery beds, and it is the only herbage which they transplant. They know the advantage of topping. That tobacco which is destined for seed is planted separately upon the very best spot, generally in a higher locality. In some places they use to plant tobacco within the inclosures, near their houses, which have been employed formerly as buffaloe stands. The leaves are gathered from March to May; the best are considered those which are full grown in the beginning of April; they contrive however to gather the leaves even during the rainy season until the inundation sweeps away the plantation. The same spot is never planted twice in succession with tobacco.

No tobacco is exported, and every family raises as much as is wanted; in the capital however the petty retail trade with segars is not inconsiderable.

Betel-nut (Areca.)

The greatest part of this article of necessity for the Burmese is imported from the south, the rest is cultivated in the low islands above Maulmain, several of which are covered with the areca palm. The Burmese pretend that it does not grow in the upper country, and I did not see any tree in that part of the province where the influence of the tide ceases.

The trees yield only a moderate number of nuts annually. A plantation, however, is considered notwithstanding a good property.

The consumption of betel-nuts is very large, and it has been calculated that every person, except children, uses two nuts per day.

Betel leaf. Piper betel.

Betel-nut is never used otherwise than together with betel-leaf, (the production of a quite different plant, a slender vine.)

The Burmahs cultivate it throughout the province of Amherst, every family having generally a small patch of ground close to the house devoted to such a plantation, if possible in a moist situation.

Place and manner of cultivation.

The plant grows freely without any of those difficulties which are experienced in India (Bengal and up-country,) where a kind of mud wall enclosure is raised to shelter it against wind and sunshine. The prevailing great moisture of the country during eight months of the year, seems to be especially favorable to its cultivation. Sticks, sometimes with cross sticks, are placed in the ground before the tender plant, which the vine soon ascends; and betel plantations resemble very much the European hop gardens.

Among the Karens.

The Karens do not take the trouble to prepare a particular spot for its cultivation, they plant a vine close to one of the too frequently-met-with decaying or stunted large trees round their villages, allowing the vine to ascend. They say

that it does not like to climb up living trees, and that the vine perishes if any other creeper, parasite or epiphite, occurs on the same tree.

As the plant does not succeed well in the arid parts of the northern provinces of the Burmah Empire, the surplus could be advantageously brought to Ava, which is now done to an inconsiderable extent.

A betel garden, if only partly properly attended, lasts from 10 to 20 years.

Sugar.

The sugar cane is very well known and was probably introduced from Bengal. But the extraction of sugar is not practised, and even boiled sugar-juice (jaghiri) in many parts imperfectly manufactured, in others imported as a luxury, and amongst the jungle Kareans unknown.

The greatest part of the Burmese families have some few cuttings round their houses, which they eat when ripe in the crude state.

Indigo.

Indigo seems to be indigenous in the northern parts of Burmah, but not in the Tenasserim provinces. The inhabitants, though well acquainted with the plant and dye, do not understand the value of it, and plant of it just as much as they want for their own use.

The plant does not seem to be particular with regard to the soil. The little I have seen of it was equally beautifully growing in low marshy ground, and in the mountains inhabited by the Kareans.

Speaking of it as a dye, it may be just as well to mention that they plant a shrub called nibe, whose root they use for red, besides the bixa orellana, and jack for yellow. All colours however are not durable, partly on account of their nature, partly because they are not acquainted with the use of Mordants.

Ava hemp.

This plant has been introduced from the dry and high parts of Ava, and thrives tolerably well. It is however not used on account of its valuable fibre, perhaps equally good as phormium tenax, but for the sake of clearing the jungle. It has the same property as our hemp—of not suffering other vegetation, where it grows, and it is astonishing to see how quick all the lower vegetation dies away, where the plant springs up, and this even at the height of the monsoon when it is the most luxuriant.

Sesamum oil.

This is the only vegetable oil which the Burmahs use for burning; cocoanut oil is considered too expensive, mustard is unknown, ricinus oil, though the plant grows abundantly wild, is not used, and wood oil chiefly only employed for medical purposes. But a great quantity of naptha or petroleum is used in Maulmain, chiefly by the Talains, who emigrated from Rangoon and other parts of Pegu, and where it is the common material for burning. The price of petroleum, even after being brought by sea to Maulmain, is so low, that it is considered less expensive than sesamum oil. Though it possesses a strong and disagreeable smell,

emitting besides a great quantity of black smoke, the Burmese seem to like the first and to be regardless of the second.

It may therefore be easily imagined, that the cultivation of sesamum oil plants must be very limited, and will likely not increase as long as petroleum can be obtained.

Fruits and vegetables.

(a) Pine apples.

It is very difficult to determine if this fruit which grows most abundantly and luxuriantly throughout the Peninsula, almost wild, has been introduced from America, or if it is indigenous.

If originally an American plant.

How are we to account for the fact that many of the pretended American plants introduced into the Eastern hemisphere within the comparatively short period of 300 years, wandered hundreds and thousands of miles into the interior, and are now growing spontaneously over wide tracts, where scarcely any population ever has been.

It would be more probable if we had examples of such a spontaneous disseminating and spreading of useful plants equally in America. But where in the mountains of Brazil do we find coffee in a wild state; where cinnamon, cloves, and nutmegs on the Antilles; where even do we find cocoanut trees in the interior of America in a wild state?

And yet the guavas grow wild in the great forest belt on the foot of the Himalayas, the bixa orellana is on the frontiers of China and in Siam.

Besides this the nature of the Asiatic people is so indolent, indifferent or diffident, that they certainly did not bestow great care to add one or the other plant of obsolete use to their inexhaustible vegetable riches. In several parts of India, the people strongly objected to the cultivation of potatoes. Vanilla and cocoa, failed hitherto entirely in the Indian Archipelago, because the people are too indifferent.

I would unhesitatingly assert, that the bounty of nature had originally adorned both sides of the hemisphere with some of the useful productions, were it not that other reasons speak against it.

The language of the natives has no particular name for some of these productions. This for instance is the case with pine-apples, where the American name of annanas is transformed into Naunah (Thi.) Thi designating fruit.

Most common fruit.

Bromelia annanas is undoubtedly the most common fruit in this country. In the month of June and July a boat load can be obtained for one rupee. It is abundant chiefly in low grounds, but it is likewise abundant in the mountains amongst the Kareans. Moderate indulgence seems to have no pernicious effect upon the health of Europeans, as has been formerly supposed, and is the common opinion to this day throughout India. I think the natives are here unacquainted with the property of the leaves, to yield, if macerated, a very good fibre for manifold purposes.

The Musa Paradisiaca is to be found in the highest perfection in this province. More than twenty varieties are known to exist and to be raised, of which several are particular to the country, and the greatest part of them is superior to any one to be got in Bengal. They thrive well every where, without the slightest care, and are justly considered as that production which yields, on a comparatively small space of ground, the greatest produce. No Burmah or Karean house is to be found without a plantation of plantains. *(b) Plantains.*

As the Kareans leave at least every three years their abodes to migrate farther, they are of course obliged to leave their plantain gardens behind them. Generally not removing very far, they visit their former gardens from time to time, and have the advantage of reaping the fruits of two plantations; but removing again a second time, they abandon them entirely on account of the great distance. Jungle springs rapidly up and covers the sites of former habitations, a great deal of fruit trees, and chiefly the delicate plantain, perishes overwhelmed by a stronger vegetation. I found often however these trees in the depth of the forest which, to judge from the symmetry in which they were growing, must have been formerly planted.

The fruit left without care deteriorates rapidly, and in a short time is so inferior as to be only acceptable to monkeys, which break the branches when still unripe. I do not think that the plantain is wild in the country, at least I never saw it, though I had opportunity to discover two other but different species of Musa.

This is a much beloved fruit, which occurs wild and cultivated. Almost every family possess a growth of jack trees, and they are chiefly planted by Pungyees or priests round their houses and round the pagodas in great quantity. They begin to bear in the sixth year and are very productive when ten years old. The particular odour so offensive in the jack in Bengal is not so perceptible here, and altogether the fruit is considered much superior to that produced in India, excepting Ceylon. *(c) Jack-tree.*

The number of jack trees scattered throughout the province must be very considerable and is daily increasing. Should this tree prove to yield acceptable caoutchouc, a great supply would be obtained from all parts of the country.

The mangoes are very inferior, and are rather to be considered noble forest than fruit bearing trees. They attain a gigantic height and extension, and are found throughout the country in a wild state. The natives eat the wild fruit of them, which is generally very acrid and has a strong smell of turpentine. *(d) Mangoes.*

Besides oranges (of a rather inferior quality) the Burmese do not possess any other cultivated but many wild growing fruits, some of which are very agreeable. As many are peculiar to the country, and nobody has ever tried to ameliorate them, several certainly promise to become in time valuable pomological additions. *(e) Other fruits.*

As I do not know at this time the botanical genus and species of many, I desist from enumerating a useless number of Burmese names, changing besides in different districts.

I observed that the Burmese very frequently prefer jungle fruits to those which have been cultivated; in fact their taste is so peculiar in this respect, that they consider many things as delicate which appear tasteless and repugnant to Europeans.

The Burmese are very good practical botanists—boys of ten to twelve years of age know the names of almost every tree, shrub, and even herb, and its properties. Their constant life in the jungles, which is their proper home, renders them very soon acquainted with the natural productions of generally striking appearance which surround them. Their chief food consists of rice seasoned with curries. But for the latter they do not choose the common Indian ingredients, but going in the next jungle, make a quick selection of leaves, pods, flowers, berries and roots, of which they compose their favorite dishes. In a great measure they deserve to be called a leaf-eating nation. They enumerated to me sixty different species of leaves, which they consider good food.

It has several times happened that Indian convicts have effected their escape into the woods, but were obliged to return and deliver themselves up, because they were on the point of starvation, which never would have happened to a Burmah, and much less to a Karean, who knows how to live for a length of time upon the spontaneous productions of the forest.

To complete the list of eatables, I conclude by mentioning the other vegetables which are in use in common with other parts of the tropical eastern regions. These are:

Capsicum annuum, Hibiscus esententus, Solanum melongena, Convolvulus batatus, Dioscorea, several species of Momordica, Cucurbita and Cummis, Curuma longa, Amomum Zingiber, &c. besides some pulses as Doliihus, Bengalensis, licer arietinum, Pisum sativum, Azachys hypogæa, Phaseolus, and finally some kinds of Arum.

IMPROVEMENTS IN AGRICULTURE WITH REGARD TO COLONIZATIONS.

NO part of the British possessions in India merits so much consideration as a place of settlement for European colonists, as the provinces of Tenasserim; by possessing so many advantages without sharing the disadvantages of the rest of the Indian possessions.

1. The greatest part of the fertile soil in India is occupied, chiefly that which is situated near navigable rivers or near localities affording facilities for the transport of its productions.

Colonization in India disadvantageous.

2. The country is the property generally of great landed proprietors who farm it out. The European who wishes to rent it must of course surpass the offer of the Indian farmer, he is therefore obliged to rent much higher and incur a greater expense. The land rent being itself, in favourably situated fertile parts, considerably high; (viz.) Patna, Monghur, &c.

3. In most cases the European is considered an intruder and too frequently he will experience chicanery and difficulties thrown in his way by the native population.

4. The laws as well as the records of landed property are in Hindoostan intricate, and in many cases the European will find difficulties to ascertain even the positive extent of his rented or bought ground, and when he has finally taken possession of it, the encroachments of his neighbours upon his borders will too frequently be repeated.

N. B. It is only necessary to direct the attention to the constant Guerilla warfare of the Indigo planters, and the animosities between them and the Indians.

5. The Indians are a people full of prejudices, and their ludicrous caste system will form an odious obstacle as long as the foreign settlers are dependant on the natives, which will probably be for ever.

6. The soil, though in many parts very fertile, is not inexhaustible. India is a country which has been cultivated thousands of years and regularly cultivated, so that to insure a certain produce a regular cycle of agricultural production has been introduced. The European therefore who engages in a particular branch of cultivation, such for instance as sugar, can only every three years plant the same spot with the cane, and is obliged to engage in other speculations the rest of the time, to render his possession at least partly productive.

7. India is in its productions more limited, Bengal is not suited for many productions of the equatorial regions; and the south parts of the Peninsula (experience has taught) are not capable of producing several of the most valuable productions of the Eastern Indian Archipelago.

8. The climate of the greatest part of India is obnoxious to a European constitution, and though there are enough examples of Europeans who stand the sun very well, the number of fatal and premature deaths on account of exposure is too common to require an illustration.

These are the objections against Indian colonization.

The same points applied to this part of the British possessions, show the following results :—

1. The greatest part of the soil in the Tenasserim Provinces is unoccupied. The whole extent computed to be about 33,000 square miles, is inhabited by not more than 100,000 people, consequently three inhabitants upon a square mile, an astonishing ratio even unparalleled in most parts of the dreary north, and this is soil of the greatest fertility, yielding 60 to 200 fold crops : there are fertile plains of which in Amherst Province 3,000 miles are regularly inundated, repeatedly fertilized and therefore inexhaustible, and this is land affording such facilities of water-carriage as no other country possesses, except the neighbouring Province of Pegu.

N. B. Regarding the scantiness of population, it would be indeed incomprehensible to account for it, did not the history of Burmah give an easy clue to the solution of this problem. The constant exterminating policy of two neighbouring and equally powerful states, never ceasing warfare, the system of carrying into slavery a whole population, the oppression of the Government, and finally the consequent voluntary expatriation of the people are the reasons. As an example of the latter may serve, the emigration into Siam of 30,000 Talains, inhabitants of this province.

2. The greatest part of the land (and in fact according to the Burmese laws which are observed, the whole) is in the hands of Government ; and it depends entirely upon its disposition and regulations, to assign lots and to issue grants. Europeans intending to settle here would therefore have the best choice of land.

3. The Europeans would not be considered as intruders but as benefactors, who would introduce useful arts and mechanical skill, of which the people are in great want.

4. A sensible regulation and laws would render every distribution of territory easy, by which the intricate lines of demarcation would be entirely avoided.

5. The Burmese are an entirely different race from the Indians, as well in their moral as in their physical constitution. Their religion sanctions toleration,

and happily their creed does not teach them to be the only chosen people in preference to all the rest of the creation. This conciliatory faith does not nourish an aversion against strangers. From the moment the British arrived in this country and acted moderately, prudently and justly, and after seizing the reins of Government, conferred never-before enjoyed blessings on the population, they behaved like thankful children towards their superiors, and in no part of the vast dominions of the British in the east will be found a more attached people and one upon whom their masters can so safely rely as the Burmese.

It must be therefore a great satisfaction to an European to find himself environed by a people who are in every respect superior to their western neighbours, and a greater degree of congeniality may be expected when time shall have amalgamated the two races.

6. On account of the great fertility of the soil, which remained for ages in its state of virginity, a regular system of alternate agriculture would not for a length of time be necessary, and sugar, cotton, indigo, and even tobacco, could be raised on the same ground without interruption for several years, and if a change should be necessary, equally good lands could be obtained in the vicinity. On the other hand perennial cultivation could be carried on with the greatest facility. Cinnamon, coffee, &c. could be tried in different localities, and that ground mostly suited to them afterwards selected for a large plantation, whilst in India, land once purchased or rented must be retained, should the soil suit for the intended cultivation or not.

7. Though the northernmost parts of the British possessions of Tenasserim (the Province of Amherst) cannot be expected to be suited to productions, confined to the equatorial parts of India, the southern parts may be well fit to raise some of the most precious spices. It is a practical observation, that as far as mangosteens and durians grow, also nutmegs and cloves can be expected to thrive well, and as the mangosteen grows freely at Mergui and the durian extends as far up as Tavoy, the cultivation of nutmegs, the most valuable of all, may be expected to become profitable in the southern parts of Tenasserim.

8. Finally, the climate is such as agrees with an European constitution perfectly well, notwithstanding the great moisture, the exhalations are not pernicious like in Arracan, and malaria is little known, whilst the humidity contributes to cool the air. Even during the hottest months an exposure is not dangerous and all careful precautions against the sun, so tedious in India, are never thought of here.

As a striking proof of the healthiness of the climate, H. M. 62d Regiment, the men of which enjoy a state of health, perhaps unparalleled in India, may be mentioned.

After having enumerated all the great advantages which the provinces promise to an European colonization, it would be unjust to pass over the one great obstacle peculiar to the country.

This is, want of population, and consequently an enormously high price of labour, and even if these are conceded, the indifference or rather independence of the people, who have no inducement to gain money, as all their limited wants are easily satisfied.

Was the colonization in these parts carried on in such a large scale as that from Great Britain to Canada or Australia, the difficulties would much easier vanish, but as probably in the commencement only limited numbers will be inclined to settle, other means to supply manual labour should be devised.

To effect this there appears to be two ways:—

(a) Either to direct the flow of Chinese emigration, now directed towards the Indian Archipelago, from thence to these provinces:

(b) Or to engage Indian (Bengal) coolies, as has been recently attempted in the island of Mauritius.

The Chinese emigrants are at any rate preferable. They are a hard working industrious race, skilful in agriculture, and acquainted with the arts of civilized life.

The Bengallees, on the contrary, who leave the country, are a weak, half-starving race, who would contribute to demoralize the country, and would be besides despised by the Burmese.

The only advantage would be that they can be obtained with greater facility, less expense and lower wages. It seems however that the plus of labour, which justly may be expected from the hardy Chinese, would compensate for the higher price they may demand for their labour.

An assistance for the first settlers in some measure would be the hire of Government convicts, transported to these provinces. Their number however is limited, the greater part reserved for Government work, and as their fetters are always a material impediment to their working in the field, the assistance expected from them must always be insufficient.

I will now briefly indicate my observations upon the soil and the different localities, in conjunction with those branches of cultivation which appear to be the most recommendable and promising.

The natural fertility of the soil already so productive in the cultivation of rice and peculiar qualification for this invaluable cerealium, render the country fit to be the granary of a great part of Hindostan.

Notwithstanding the imperfection of the cultivation as above described, the crops successively raised on the same spots are astonishing, so that notwithstanding scarcely a tenth part of the rice grounds is under cultivation, the surplus is so great that the maund of rice costs only six annas at Maulmain.

But with a regular system of husbandry, the produce could be greatly augmented, and if a system of irrigation were introduced, a continual succession of crops could be achieved.

The irrigation should be either such as in some parts of India, where the fields under rice cultivation are divided into compartments surrounded by dykes for the purpose of retaining the water, and as the sources of supply for irrigation are so close at hand in this country, the only care would be to keep the dykes in order, of course no manure being required.

Or it would be perhaps easier to dig out the fields so deep that they may be during the dry season regularly twice the day overflown by the rising tides, an operation by no means too difficult, as the rice grounds during the dry season are only from 3 to 6 feet above the level of the rivers, and as the country is an uninterrupted plain of equal height, the operation could be carried on throughout as far as the influence of the tide reaches.

N. B. On the Gyne river this influence extends 130 miles from the sea.

This command of water, the only requisite to an uninterrupted succession of crops, could here equally call forth the interesting phenomena to be seen in some of the flourishing parts of Java, where it is not uncommon to be able to trace the whole process of cultivation going on in the same time in the field; and in which way six crops can be obtained in two years and a half.

These fields would probably be unavailable during the height of the monsoon on account of the high inundation, but so much alluvion would gather there during this time, that a double fecundity could be expected from the next crops.

It seems that this proposition would be of little consequence in a country where unoccupied land is so abundant. But the first clearing and preparing the ground is very expensive, and it is therefore of greater consequence, if the same land once prepared produces more abundantly than the usual crops.

The cultivation of the cane will always be considered one of the most valuable tropical productions. *Sugar.*

Sugar requires a free rich soil, so far elevated as to be entirely exempt from inundations, but not so high as to be in want of sufficient moisture; sunk localities further must be selected where its greatest enemies the white ants (termites) have not the means of propagation. It ought to be therefore well cleared land, and all the remains of a former forest, such as standing trunks, pieces of wood, &c. either removed or well burnt.

With respect to the chemical composition of the soil, sugar cane is not so particular as cotton and tobacco, but it likes to have from 10 to 15 per cent. lime.

Of such land as just described, the province has a great abundance. As the cultivation from the beginning to its maturity requires a period of upwards of fifteen months, all the plains inundated, even only during a part of the monsoon. must be excluded from its cultivation.

But the lands next abounding in humus are the most suited.

The valleys between the sandstone ridge extending from Amherst to Maulmain, are undoubtedly the best localities in the vicinity of the capital.

Further removed that abovementioned valley, skirted by the Siamese mountains, seems to be the next best place.

Tobacco. To the quality of the soil it must be ascribed that particular districts enjoy a reputation superior to others in producing tobacco.

As long as the quality of the soil has been measured by the outward appearance, the light red and chesnut brown coloured lands have been considered the best. Since chemistry has been applied to agriculture, it has been found that the oxydes of iron are the chief constituents of a good tobacco soil.

But if it is not enough that iron predominates in the soil, it is also necessary that the soil be a heavy rich one.

These qualities are eminently united in the grounds of this province. The existence of iron ore in its different forms spread throughout the country has impregnated the soil so much that the per-centage varies from 8 to 35.

This at once should lead to the strongest recommendation to engage in the cultivation of tobacco; much more, as all attempts in India have hitherto more or less failed.

As the growth of tobacco is short, I would recommend to try some of the richest rice lands immediately after the inundation, planting them from nursery-beds, which have been laid out in some adjacent spot a month before.

Indigo. It is doubtful if this valuable article, which constitutes a great part of the riches of Hindostan, will soon become an article of importance in these provinces.

It is the want of practical knowledge which indigo planters here must possess, which will form an obstacle to any one who engages in this plantation. Even if he could provide himself with a factor from India who has an extensive knowledge of the whole operation, I suppose his experience would be of little value in a country in so many respects totally different from India. Experience has shown that in Java the first attempts to cultivate indigo, following the Indian method, failed entirely, and that only reiterated experiments were at length succeeded by more promising results.

The plant thrives luxuriantly in this province; it is, however, generally believed that the indigo raised on the dryer lands near Ava is superior; it is, however difficult to know, if a more skilful process in preparing the indigo or the natural quality of the plant is the reason of the superiority of the dye.

Engaging in the cultivation of cotton, it depends entirely on what species the cultivator may select. Though it is generally known that every species delights in a soil impregnated with a considerable per-centage of lime, yet climate, moisture, situation and altitude greatly contribute to render the production of cotton in some parts extremely favourable, in others a complete failure. *Cotton.*

Gossypium Herbaceum as already mentioned, is the only species the Burmese cultivate.

In different parts of the Provinces the Pernambuco.

Cotton has been tried by Mr. Blundell, the Commissioner, but it is to this moment very unpromising.

The species which seems to be the best suited is the Gossypium Hirsutum, and perhaps that species which is advantageously cultivated in Luzon.

Coffee is the article for the cultivation of which the country seems pre-eminently adapted. It is a cultivation which is the best suited to a thinly inhabited tropical rich country, requiring less labour to raise abundant crops in shorter time than other productions. *Coffee.*

It is a plant which will grow in every soil, provided that the roots can penetrate without difficulty into the ground. Hilly country formerly overgrown with jungle is the situation in which coffee delights. In the first time it will be only necessary to clear small patches in the jungle at a certain distance one from the other to plant the trees. It is even advisable to leave the rest of the jungle and high trees standing, as young coffee trees do not endure the power of the sun well, which brings the trees to a precocious maturity.

Coffee presents finally the advantage that its cultivation can be undertaken with but a moderate capital, on account of its ample and quick return.

It is difficult to speak about the advantage of a clove cultivation, as it has never hitherto been attempted. *Cloves.*

Either the same genus Caryophillata or another genus of the family of Hesperideæ closely allied to it, is very abundant in the forests. It would be advantageous perhaps to try its cultivation in different parts of the province, and the results could be very soon known, as the tree has a very rapid growth.

Cinnamon. The true Laurus Cinnamomum has not yet been found wild in the country, there are however five other species of this genus, all inferior; one of which appears to be Laurus Cassia.

There have likewise no experiments been hitherto attempted to plant cinnamon.

It seems however that this is a branch of tropical cultivation in which probably no private individual will engage in these provinces at present, as other articles promise to redeem labour and expense much earlier, and when the large plantations now laid out in Ceylon arrive at maturity, the price of cinnamon will probably considerably fall, as it does not seem that the consumption of this article in Europe will increase materially. Plantations laid out in other parts will therefore have an unfortunate competition.

Nutmegs. This most valuable of all spices seems to be confined within much narrower limits round the Equatorial line, than other original productions of the Indian Archipelago, as it does not ascend higher than the 10th or 12th degree of northern latitude.

The experiments made by Mr. Commissioner Blundell to introduce this tree into Maulmain do not promise much. The trees do not perish, but they vegetate poorly.

The article however is so valuable, that repeated experiments in different localities should be undertaken before forming a decisive conclusion, but much more in the provinces of Tavoy and Mergui than here. The flourishing state of the nutmeg plantations in the Island of Penang should be a great stimulus to the other provinces on this coast.

Tea. It is very doubtful if this most important article will ever be cultivated in these provinces.

Tea is a sub-alpine plant in tropical countries, and descends not in the plains before the 30th degree of northern latitude. Its natural situation or the proper sphere of its spontaneous occurrence, seems to be in the mountainous tract of the country, which separates southern China from the Burmese and Siam countries.

The discovery of the Tea plant in Assam corresponds with the locality indicated by Capt. McLeod, who found the plant pretty common 5 degrees to the eastward, in about the same latitude.

(N. B. Barrow found the mean temperature of the Tea countries, chiefly at Thekiang in China, to be 56 at sun-rise and 62 Fahr. at noon.)

The province of Amherst, composed chiefly of alluvial plains and secondary hills, is evidently too low and too warm for its introduction.

Only the highest part of the great chain separating Siam from the British possessions, could be an adequate locality. An attempt to erect an experimental establishment there, would however be at present attended with great difficulties, as this part of the country is totally uninhabited. But there are besides other objections.

The preparation of Tea is such as requires great skill and much manual labour. It is therefore only in countries, where population is abundant and price of labour very cheap, that the cultivation should be attempted.

I should suppose that Assam and the whole corresponding sub-alpine tract of the Himmalaya is a much more congenial country.

Pepper.

Pepper will grow freely and without much care. The natives cultivate it sometimes like betel leaves, and often with this, plant together, but the number of pepper vines is inconsiderable. As long as Malacca, but chiefly Sumatra and Borneo, furnish such unlimited quantities at such a cheap rate as they now do, a favorable competition cannot be expected in these parts.

Ginger.

The country seems peculiarly favourable to the introduction of ginger, which is raised chiefly for home consumption. But it yields so abundantly and is to be got at such a cheap rate, that the abundance of this article in Maulmain should be generally known.

The mode of planting it is the same as potatoes in Europe are cultivated, only that instead of a plough, manual labour is chiefly employed.

Cardamoms.

This plant grows wild in the woods, and the Kareans make use of it, both of seeds and of the herb, for culinary purposes.

The same curious fact which has been observed on the Malabar Coast, that cardamoms spring up in places where they never existed before, after the forests which covered the surface were burnt down, is well known to the Kareans, and I never saw the plant otherwise, than just emerging from the ashes of late incendiarism so common in the forests. Unquestionably the seeds scattered by the winds find a congenial soil in the ashes.

The cultivation could be successfully carried on in the mountainous parts of the country.

Castor Oil Plant

The castor oil plant is in the greatest abundance on the banks of the large rivers in the higher parts of the province spontaneously growing, without its property to furnish oil seeming to be known. The plant besides is known to eradicate every weed where it has once taken root, and I would recommend its being disseminated in all parts occupied by tiger grass.

(a) To destroy the tiger grass.

(*b*) To furnish a cheap and abundant substitute for the sesamum oil.

(*c*) Perhaps that the people by its abundance would be induced to rear in time the erria silk worms, like as is done in Dinajpore and in Assam, the caterpillar feeding exclusively on ricinus.

Corchorus Capsularis W. or *Paut.*

This plant is almost every where on cleared places in the greatest abundance.

In India it is cultivated with some care, yielding materials for ropes and chiefly for gunny-bags. In this country the plant could be propagated to any extent. It would be perhaps even worth while to collect the wild growing plant.

But the best material on account of its fibre as a substitute for hemp and flax, seems to be the pine apple, which as already said, grows and propagates with the greatest alacrity. A plantation of pine apples costs very little, and once rooted, may be entirely left to the care of nature, without apprehension of its perishing.

IV.

VEGETABLE PRODUCTIONS, SPONTANEOUSLY GROWING.

THIS substance can be obtained in very large quantity. The tree yielding the oil is one of the most magnificent forest trees, attaining sometimes the height of 120 to 160 feet with a circumference of 8 to 12 feet. The trunk ascends perpendicularly without dividing in branches to the height of 50 to 90 feet, when it separates into a crown resembling very much the Italian pinia trees. The oil is extracted in the following manner: *Wood Oil.*

With an axe, or generally a Burmah knife, a hole is made in the trunk, sometimes one foot square by six inches high and six inches deep, and then a fire kindled in the same place where the tree is so severely wounded. This has the effect, that the oil contained in the pores of the wood is attracted towards those parts of the tree, and flowing copiously out, is collected in common earthen pots. The quantity which can be obtained is very great. The Kareans assert the quantity to be five to six gallons from a large tree immediately after the monsoon. I however never had an opportunity to see so large a quantity at once extracted.

It is very easy to conceive that the tree greatly suffers by this process, the natives however assert that it very seldom perishes. The tree notwithstanding has a sickly appearance, and when the same operation is twice or three times repeated at short intervals, it dies.

In the southern provinces these trees are much more common and constitute large forests. A great quantity of oil could be obtained in a most easy way. The Kareans use it for their domestic wants for burning much more than the Burmese, at least in the Province of Amherst. An unction with this oil in rheumatic diseases is by all natives considered to possess remarkable virtues.

Many plants yield this valuable production, amongst which the caoutchouc of two creepers, chiefly that obtained from the Kiejaun, is undoubtedly the best. *Caoutchouc.*

The family of fig-trees yield inferior qualities, the worst of all is obtained from the pipul.

Ficus elastica (the proper East Indian caoutchouc tree) occurs in the highlands to the north, it has however never been tried. The juice of some of the other plants coagulates on the spot and forms elastic gum. These species

must be treated with the greatest care, so as to have no impurities mixed with the stuff, which however it is very difficult to persuade the natives to do.

The quality of the East Indian caoutchouc is equal to the American, and only the imperfect method of preparing it has been the reason that East Indian caoutchouc fetches a much lower price in the market.

The caoutchouc of the Keiphaun can be easily precipitated by acetic acid, and can in the first instance be brought in any form. The American method of drying the caoutchouc in earthen moulds in the sun, does not succeed here during the wet season from May to December.

Camphor. Neither laurus nor dryobalanaps camphora occur in this Province in a wild state, but the natives extract by distillation a produce having all the properties of camphor from a syngeneseous plant belonging to the sub-division of verbenaceæ or eupatorieæ, which is very common throughout the country. The quantity which is obtained from this plant in the dry season is not inconsiderable, and a more perfect process of distillation would probably increase the quantity, as well as a second rectification ameliorate the quality of the produce.

Several labiatæ of this country yield camphor like our lavandula and mentha, but in too small quantities to be of practical use.

Gamboge. Two trees of this province yield gummi guttæ, which exudes by making incisions into the bark. The juice flowing out resembles rich milk with a yellow tinge. When exposed to the air, it attains a bright yellow colour, thickens, and becomes finally compact. Both are different trees from the stalagmites cambogicides and equally different in their chemical qualities. The gamboge of this country dissolves very little with water, and consequently does not yield that yellow emulsion as the common guttifera. It will never serve as a color, but it promises to give a very beautiful varnish. Its medical properties (a powerful drastic) are the same.

Common Varnish. The natives get from the fruits of a shrub (which I have not yet seen in fructification) a varnish with which they cover their baskets and other utensils to render them impermeable to water. This varnish resembles very much the vernis de chine which is obtained from the augia Chinensis, but that must be a different plant as it is obtained by incisions into the bark. It is when impure brown with an olive hue, smells like turpentine, tastes astringent, dissolves slowly in alcohol; can be solved in kaliley and separates under a certain degree of heat, benzoic acid in chrystals.

Dammer. The dammara alba occurs in the northern districts only rarely. It is, however, as I am informed, very common in Tavoy and Mergui.

Copal. A large tree, resembling the elœocarpus, but different from the East Indian elœocarpus copalifer, produces a kind of copal, which is yellow, transparent, and

possesses a vitrious fracture, but it is not collected, and its use apparently unknown.

Though not a vegetable production, it seems to me this is the best place to introduce this article. Stick-lac occurs in the mountainous parts of the great northern chain. It is the true produce of cocens laccæ, and the trees which the female insects select to assist in the propagation of their progeny, are several species of the ficus. *Stick-lac.*

The wild Kareans are well aware of this occurrence, and know the produce, without however knowing its value. They informed me that at the time when the lac appears on the branches in the height of the monsoon, many trees are entirely covered with it, but that scarcely a fortnight passes before the rains have washed every vestige away.

It would be difficult to induce this independant and timid race to collect the produce, and people ought to be sent from the low-lands into the mountains at the time when the lac dye is developed in its greatest perfection.

Before concluding this division, I cannot omit to speak of the teak leaves, as a much promising dye. *Teak-leaves.*

The discovery of Dr. Burt induced me to make experiments with the leaves, and I followed strictly his method, but I am sorry to say I could not succeed in obtaining a *yellow* dye, neither from the dried nor fresh leaves, neither by making only an infusion, nor by boiling 1, 2 or 3 hours.

The effect was always uniform, that of obtaining a dark purple color with nuances into brown.

I employed alum, acetate of iron, acetate of copper, muriate of tin, as Mordant's, but I was never so happy to obtain that result, which Dr. Burt proclaimed.

It is known that the number of ligneous plants increases the more one approaches the equator; in this country, the proportion of ligneous plants to the herbaceous is as 3 to 1. *Forests.*

But it is not in all countries that under the same circumstances trees arrive to that perfection, durability, height and dimensions, as in this province, which indeed is a perfect woodland. For wherever nature has an undisturbed field to develope her energies, the ground is occupied by trees, and with the exception of the few parts where human application or human destruction has changed the features of the country, do we find an interrupted mass of trees. Here are neither Savannahs like in America, nor sandy plains, here is scarcely one bare rock to be met with; and even those parts, which are exposed to the influence of tides, present an uninterrupted canopy of mangroves and other trees delighting in brackish water.

The number of ligneous plants that have been previously enumerated is 160 species, but this is far from being the complete number.

With safety we may assume that 200 different species of trees, 300 plants to be ranged between trees and shrubs, 350 species of shrubs and about 150 ligneous creepers occur in this country, leaving a very small proportion to annual plants, parasitic epiphites and bulbous plants, of which again one-third may be called parasitical creepers and climbers, one-third orchideous bulbasæ and other epiphites, and only one-third part of all the rest of the flora phœnorgamica together.

The catalogue of timber trees is not inconsiderable, and at least 10 to 20 species seem adapted for ship building, though none besides the valuable teak has hitherto been employed by Europeans. The Thingan, the Pinmah, the Zakayan, the Lephion, the Ajadan, the Thoduin-thee, the Theezee-ghi, seem to be the next in rank.

Teak-forests.

The teak forests do not occur contiguous throughout the country, seldom also intermixed in the forests with other trees—generally they occupy almost exclusively the ground where they appear. It is difficult to determine the conditions of the soil, on which teak trees will grow. It is much easier to answer the questions negatively.

(a) The teak will not grow on low ground which is exposed to the regular influence of the tides.

(b) On rich alluvial soil, without a substratum of clay or gravel.

(c) On places under otherwise favorable circumstances, where already other trees have got the ascendancy.

(d) On bare limestone hills.

(e) On poor sandstone ground.

(f) On black clay slate.

(g) Upon mountains attaining a considerable height.

The most frequent localities are moderately elevated sloping plains (very often near rivers). The teak forests in this country are either in the neighbourhood of the Salween, the Thou-khan or the Attaran river.

I had only opportunity to visit those on the Salween. There a greater number of trees perish by bad management than are used.

(a) The persons occupied with that part of the labour called killing the trees, destroy a number which they do not find afterwards fit for use.

(b) This number of killed trees which are suffered to decay, generate a host of insects. Though it is pretended that teak is not attacked by vermin, yet a great deal of these decayed trees are attacked by bostrichus passalus and other coleopterous insects—and the consequence is that these animals have attacked other good trees, before they were sufficiently seasoned.

(c) The same negligence of the natives which reigns throughout the country, with regard to wanton destruction of the forests by fire, extends equally to teak forests, and I saw extensive tracts utterly destroyed, because it was the pleasure of some wild Karean, to fix his abode in the vicinity, and for this purpose to clear the jungle by burning all down.

As teak is such a valuable article in general, and it may be safely asserted, hitherto the only one to which Maulmain owes its daily increasing prosperity, the preservation of teak-forests should be the principal care of Government.

But not only the preservation, equally so the multiplication. It cannot be denied, that even with good management, the number of trees must yearly decrease, and that timber in localities of easy access must soon become rare. Experience has shown that new trees disseminated by nature, on places where timber has been hewn, grow only very scantily up.

Teak plantations therefore will be of the greatest importance—and this not only on places where teak already existed before, but also in localities which in regard to chemical composition of the soil and other circumstances, are equally well fitted.

Government possesses such vast tracts of country in these Provinces, that a choice of land to accomplish this cannot be difficult, and how could the land be better employed, than by preserving that source of wealth, which has manifested itself already by such striking proofs.

But in the method of cultivation I would deviate from that adopted by the Dutch in Java. It is an old experience, that forest trees do not thrive well if they are treated like fruit trees or other more delicate plantations. The system of nature should be imitated. No nursery beds and no transplantations should be employed. After having cleared the jungle in the chosen places, and after having loosened the soil sufficiently to receive the seed and to be able to cover it with a little earth, I would advise the seeds being disseminated without any further care. The plantation must of course be inclosed to prevent the disturbance of any kind of wild animals. After two or three years, the plants when sprang up too close to each other, ought to be thinned, besides jungle parasites and other impediments carefully removed.

This easy operation should be annually repeated in different parts of the country over wide tracts. Localities affording facilities for the transport of timber, such as rivers and nullahs, ought of course to be the first chosen.

This would ensure for ever the existence of teak-forests, the value of the Provinces would annually increase, and in time prove a most important source of revenue to the Government.

This cursory exposition of the natural resources shows sufficiently that the country possesses the elements of great wealth and prosperity, and there are certainly many more hitherto unknown, which time and a protracted examination will develope.

J. W. HELFER, *M. D.*

MAULMAIN,
The 15th September, 1837.

FINIS.

Printed by G. H. Huttmann, Bengal Military Orphan Press.

SECOND REPORT.

THE PROVINCES OF

YE, TAVOY, AND MERGUE,

ON THE

TENASSERIM COAST;

VISITED AND EXAMINED BY ORDER OF GOVERNMENT, WITH THE VIEW TO DEVELOP THEIR NATURAL RESOURCES.

BY

J. W. HELFER, M. D.

CALCUTTA:

J. H. HUTTMANN, BENGAL MILITARY ORPHAN PRESS.

1839.

PROCEEDINGS

FROM THE 14th OF NOVEMBER TO THE 5th OF MAY 1838.

OVERLAND JOURNEY FROM MOULMAIN TO MERGUI.

1st. Ascent of the river Attaran in boats and examination of the hot springs on the Attaran. Progress to the upper part of the Zamie Khiaung.

2d. Overland trip from the Zamie Khiaung to the lower and upper teak forests and along the great eastern range to the Mickeli Khiaung.

3d. Tour to the pass of the three Pagodas and the adjoining Siamese high table lands.

4th. From the Mickeli Khiaung to Lamain, missing the road and wandering seven days in the wilds, and from thence to Ye.

5th. Excursion to the highest part of the eastern range called Zae-town and back.

6th. Journey to the Malue mountains, and from thence to the Hinzai bay.

7th. Journey along the coast to Zadie Yua.

8th. Ascent of the Zadie mountains.

9th. Journey from Nabulee Yua to Tavoy.

10th. Excursions in the neighbourhood of Tavoy.

11th. Journey to the eastward over the high range of mountains to Metamio—visit to the Tin territories, ascent of the Kamaung-thueg Bain Khiaung and part of the upper Tenass-jorim, as far as the hot springs, and back to Tavoy.

12th. Journey from Tavoy to the Towngbiaun valley and the Kiauk mountain.

13th. Descent of the Towngbiaun valley and overland Journey to Pai and Palouk.

14th. Descent of the Palouk river and along the sea-coast to Palou.

15th. Overland Journey from Palou to the east until falling in with the Tenasserim river at the Tarouk Khiaung.

16th. Descent of the Tenasserim river to Mergui.

17th. Second ascent of the Tenasserim, nine days Journey up from Mergui and back.

18th. Third ascent to the village of Tenasserim and ascent of the little Tenasserim, pursuing it as far as the high table land separating the upper part of the Isthmus of Kraw from the Bay of Siam, to the coal fields and back.

No. 1, No. 14, No. 17, and parts of No. 13 and 18, have been performed in boats—No. 16, and part of No. 18, on rafts.

The rest overland.

The overland journey led the greatest part through extensive districts without a road, following partly wild Elephant paths, partly cutting a road through the jungles.

Parts of No. 2, 4, 6, 10, 12, 13, 14, 16, 17, 18, and the whole of 5, 8, 11, 15, have never been visited before by any European.

The greatest part of the visited country being uninhabited, provisions, sometimes for a fortnight, and once for a month, were carried by coolies.

I.

GENERAL REMARKS.

The ancient distinction of India Gangetic and trans-Gangem is not altogether objectionable, but to distinguish more properly Hindoostan from the regions to the east, these ought to be named (if India they shall be called) India trans-Burhampooter, for immediately to the eastward of this river (not including its higher course) the change is great; the country assumes different features, the greatest part of spontaneously growing vegetable productions becomes different, the nations become a distinct race, adopting different manners and customs. It is reasonable to suggest that the permutation of the level plains into hilly and mountainous regions must produce every where considerable changes; but here they are striking and almost without intermediate links.

Difference of the regions of India Proper and the countries to the eastward, comprised under the name of Indo-China or India-exterior.

Whilst the great extent of Hindoostan from Bombay to Dacca, (an extent of 2000 miles in length) preserves almost the same general character, the features of the country beyond the Burhampooter at once strike the observer with the character of a new world.

This character remains, as far as it is known, the same throughout the regions of Assam, Muneepoor, East Silhet, Arracan, the Tenasserim Provinces, Pegu, Burmah, Siam, and the much less penetrated countries towards the Chinese Seas.

Descending towards the Peninsula of Malacca, the features and productions of the countries assimilate to those of the Indian Archipelago, and between the two Peninsulas, separated by the Bay of Bengal, little resemblance prevails excepting Ceylon, Tinevelly and Travancore, which seem to approach much more to the great family of the Molluccas than any of the territories comprising the Peninsula of Hindoostan.

An extent of seven degrees of latitude in a temperate zone is accompanied by great changes in climate and productions, in tropical regions the difference to a superficial observer is almost none,—to a strict examiner gradual. In a temperate zone, the difference is chiefly produced by the degree of latitude, by its western or eastern situation besides altitude, &c.; in tropical regions latitude, &c. is of minor importance; the quantity of rain, and the distribution of moisture, are the chief agencies of changes.

Difference in the Tenasserim provinces.

The difference in the natural productions, which is remarkable in the northern and southern parts of Tenasserim, is owing to the difference of climate with respect to the distribution of rain throughout the year.

Difference of rain in the northern and southern parts.

In Amherst Province, in Pegu and Arracan, the monsoon is a deluge, pouring, with little intermission, during five or six months a quantity of rain down, which finds its parallel in few parts of the globe. But clearing up towards the end of November, it scarcely ever rains the next following five months, and the heat in April is sometimes suffocating.

In Mergui Province, on the contrary, the climate approaches, the equatorial regions, it rains at least every fortnight throughout the greatest part of the year, the monsoon still exists, but it is milder and shorter, the intervals of fine weather much longer.

Formation of Amherst Province.

Respecting the formation of the country, the province of Amherst differs widely from the others. The provinces of Ye, Tavoy, and Mergui, are pretty much the same.

Amherst Province is a detached part of the great alluvial plain of Pegu, which, Bengal excepted, has no equal in the known parts of Asia.

The other parts of Tenasserim.

Ye, Tavoy, and Mergui (and seemingly the whole of the Peninsula of Malacca) are a mountainous country, intersected by valleys which are separated by long stretched, uniform, parallel running ridges, including high table lands towards the centre; and terminating in low plains or swamps on the sea coast under the influence of the tides, in localities where the ridges do not touch the sea.

General aspect.

The general aspect of the country is an uninterrupted dense forest, the number of climbers extending from tree to tree, the variety of creepers and the impervious rattan palms increasing towards the south.

Increasing difficulties towards the south of penetrating the country.

In Ava proper, we are told, the penetrating of forests is not obstructed by serious difficulties. In latitude 17, the thick brushwood, the creepers on the ground, and the sharp cutting rushes cause already difficulties—in latitude 15 the number of gigantic climbers forming labyrinths of net works increase the difficulties—in latitude 10, chiefly in low grounds, the thorny rattan palms added to the former obstructions, together with a mass of thorny cisalpinias, render the difficulties almost insuperable.

In the lower parts of the Tenasserim, and to the south of Mergui, the country can be only crossed in boats navigating the numerous nullahs and creeks.

Cleared lands fit for cultivation.

Cleared land is very scarce and only in the immediate vicinity of the villages, cleared patches of some miles extent only near the chief places of Ye, Tavoy, Mallon, and Mergui.

The best cultivation is around Tavoy, and to the southward of that town as far as Tavoy point; the most fertile cultivated spot is the valley of Taunbiauk.

The interior.

The interior is entirely waste, some straggling Karen hamlets and the newly established Christian Karen congregation of Metamla excepted, which latter is the nearest village bordering on the Siamese territories.

As late as four years ago the eastern or left side of the Tenasserim did not count a single inhabitant; now some few isolated houses are to be found there, and their numbers begin to increase rapidly.

The interior of the country south of Mergui, and beyond the village of Tenasserim belonging to the British territory, is totally uninhabited. All the country which has been made accessible by the assiduity and industry of man, when a short time neglected or abandoned, is instantly reclaimed by the unconstrained power of nature. The sites of large cities flourishing before the conquest of Alompra (1755) can scarcely be traced at present. Uninhabited.

The country must be for a century under the unremitted influence of increasing population, cultivation and civilization, before the features of the country will be changed, and before all its peculiarities and curiosities can be made known.

II.

NATURAL DIVISION OF THE COUNTRY.

1.—MANGROVE BELTS.

Mangroves planted by the Lord against the inroads of the sea.

Almost the whole coast, where not a bold promontory protrudes, and where the accumulation of land is gradual, is lined with a belt of mangroves forming a powerful bulwark against the inroads of the sea.

Rocks are driven asunder by the fury of the tempest, and their mighty fragments lie scattered over large extents along the beach; the impetuosity of the waves, repeating their action during thousands of years, undermines the hills and mountains along the sea coast, and smooths the granite to a bare pebble. The mangrove grows, feeble but alone, a powerful ruler of the soft mud over which it stands, remains unshaken, it does not give up any of its territories, nay grasps with its advancing roots at every matter, holds it firm, and adds to the extent of the country gradually but certainly.

This grows best.

The mangroves in their greatest perfection are a production peculiar to the inter-equinoctial regions, and lose their vigor beyond the 30th degree of latitude. The number of shrubs and trees constituting this family increases towards the equator.

These grow where.

The mangrove lands are impenetrable—they are one mass of soft oblivious protoplasm by a network of most fantastically looking roots of the mangroves standing above the ground. These lands are intersected by innumerable small creeks through which, when the tide rises, the water enters, and through which, in the contrary case, it again recedes. At high water the whole is inundated.

Mangroves on the Hooghly river.

A great extent of mangrove forests is at the Hooghly mouth, where they occupy a semi-circle round a bay of 10 to 15 miles in breadth, leaving only a small exit for the large river.

At the Pulooli and Pubna rivers, I saw them in high perfection, but the greatest extent of them is at the mouth of the Tenasserim river, and mangrove lands will I imagine be the chief constituents of the numerous inner islands to the south of Mergui.

Mangroves with mangroves in Bengal.

In Lower Bengal this kind of country equally exists, only the number of species is much more limited. In fact, the swamps could be properly denominated the Sunderbunds of Tenasserim.

Mangrove forests do not thrive well in pure salt water, but want brackish water, the mangrove forests are therefore always to be found in perfection at the mouths of large rivers. — Growing in perfection.

The immense mass of water at the mouths of the Ganges and Megna, mixed with the sea water of the Bay of Bengal, originated the Sunderbunds below Calcutta; to the great number of rivers in the Tenasserim provinces the great belts of mangroves to be met here are to be ascribed, especially to the numerous mouths of the Tenasserim; the numerous few mangrove islands to the south of Mergui, to a conjunction of seventeen small rivers the great extent of mangroves near the Hingal. Owing to the comparative scarcity of rivers on the Coromandel coast, the mangrove belts are there much narrower, and sandy beaches, a rarity on the Tenasserim coast, occupy their place. — At the mouths of great rivers.

The great extent of the mangrove territory has hitherto not been appropriated to any use, except in the immediate neighbourhood of Mergui, where the wood is used as fuel. It is a general opinion, that the wood is the best for burning. — Use. Their wood.

The ashes of mangrove trees contain but a small proportion of potash, whose substitute in their composition is nitrum. — Their ashes.

The bark of the mangroves contains a considerable proportion of tannin, not yet appropriated to any use, except by the natives to tar their fishing nets, but is a valuable substitute for oak bark. — Their bark.

A great portion of the mangrove ground can be rendered very profitable by planting opium trees, which is however scarcely ever done. — Besides generally grown for Kyaik-ook-cultivation.

Vide Vegetable Product.

25.—ALLUVIAL PLAINS.

The territory of the three rivers, the Salween, Gyne, and Attran, which unite before Moulmein in one magnificent stream, is an uninterrupted mass of alluvial soil, almost without exception highly fertile, and therefore naturally chiefly adapted to the growth of that most important and necessary production of the tropics —rice. — In Amherst Provinces almost entirely alluvial.

The other parts of the Tenasserim Provinces being mountainous, they possess much less of flat country which can be regularly inundated for the purposes of rice growing. — In the other parts mountain.

The population however could increase many than tenfold, and enough of plains could be cleared, fit for rice cultivation, chiefly not far from the sea coast and along the banks of the rivers. — Very more than now at present.

The greatest alluvial plain now under cultivation, fit for rice crops, is round Tavoy and to the southward of Tavoy as far as Pinnaling ghee, which — Alluvial plains in Tavoy Province.

corresponds almost with the parallel of Tacey point. It is that part which is the less cultivated, the less peopled, and most unfortunate in all the provinces.

In Ye. Province.

Large plains of alluvium exist between Ankered and Ye, very rich soil round Lemale, and on the banks of the Ye river.

Near Pulon.

From Tangoery to the eastward, the best large plains to be met with are near Pulon, which village has a considerable extent of land cleared and actually planted.

Along the banks of the Tenasserim.

On both sides of the Tenasserim, I'a miles up from Mergui, large tracts of alluvium equally rich, are to be met with, and I am informed that they continue far to the southward; yet only a small part of them is cleared.

Mergui province hitherto produced such small quantity of rice, that though the number of inhabitants does not exceed 22,000, yet the supply has not been found sufficient, and grain is imported annually from Moulmein.

That part of the alluvial plains, which is sufficiently elevated to permit the water to flow off, is much more productive than the lower land. Everything small produces for gardens, some is cleared. It is the best suited for the introduction of annual plants, such as cotton, castor oil, indigo and cogue.

8th.—SANDY PLAINS.

Sandy plains in the north of Tavoy.

Sandy plains are rather scarce in the provinces. I know only of one instance. This plain is situated to the north of Tavoy not far from the village of Na-pee-bye. It consists of loose sand mixed in a few places with a good percentage of argillaceous matter, and is therefore not unproductive. It has probably formed, at a not very remote period, a part of the sea, which retired. The vegetation upon it is scanty, part of it being cleared and I suppose it has been once cultivated. It could be cleared as positive ground for about.

At Mergui.

That part of the island of Mergui which faces the island of Madamegan is white sand intermixed with large pebbles.

The sand is impregnated with tin ore.

9th.—INTERMEDIATE ARABLE LANDS.

How constituted.

Tending from the sea coast towards the interior the ground becomes elevated; the influence of the tides successively diminishes and ceases entirely in that part where the first lower hills begin to enclose the country. Numerous small streams descend from the valleys intersected by the gently undulating hills. This intermediate country is highly fertile by the accumulation of humus through ages, and therefore adapted for a great variety of tropical cultivation, chiefly of a perennial nature, which do not require the exertion of the annual inundations, though they require a certain degree of moisture throughout the year.

Highly fertile, and adapted for a great variety of tropical cultivation.

Adapted for tropical fruits.

In the upper part of the provinces between Yo and Amherst, this tract of country comprises exclusively all the teak forests to the south of Moulmein.

Teak forests belong to this division.

It produces timber in the greatest abundance and highest perfection.

That part of the country which is denominated in Upper Hindoostan the forest belt chiefly at the foot of the Himmalaya, and which there is renowned and dreaded as the most unhealthy territory, as the pestilential generator of malaria and jungle fever, the same part is in the Tenasserim provinces innocuous, or at least equally healthy with the other parts of the country. The native wood-cutters, and even Europeans unaccustomed to the woods, stand the climate well even during the worst part of the monsoon.

The forest belts at the foot of the Himmalaya, compared with the tracts of land in the Tenasserim Provinces belonging to the division.

5TH.—INLAND VALLEYS.

The nature of the country and soil is the same with the arable intermediate lands, only with the difference that these border on the sea, these belong to the islands.

There is a great number of broad inland valleys, each stream giving origin to one of more or less extent. The greatest of all is the valley of the Tenasserim, of more than 200 miles extent, which contains many thousand acres of the very best land, though as yet without a single inhabitant.

The valley of the Tenasserim.

The valleys originated by the Attaran, Tavoy, Ye and Palou river, and those of the Bam Khisung and Kamaung-thong Khisung, are the next in importance.

And others.

6TH.—INLAND BASINS AND SLOPES.

The lowest or first range always, and sometimes the second, are composed of isolated or detached hills, which surround the neighbouring country and form a kind of basin, whose centre and sloping lower sides are generally highly fertile.

This is the part of the country which is selected by the Karenns for their cultivation and which yields all the mountain rice cultivated in the provinces, besides cotton, tobacco, hemp, vegetables and the other few necessaries of this laborious people.

Selected by the Karenns for their cultivation.

The beautiful specimen of this division, in fact the most productive tract in all the country and the best cultivated spot in the southern provinces, is the Taunbinnee basin producing chiefly areccanuts, betel vines and durian fruits. That territory is divided into about eighty compartments each tenanted by one family, and the distant slopes occupied by Karenns. The view of this great inland basin from one of the surrounding mountains is pleasing and gratifying as much as a tropical agricultural scenery can be.

Inland basin of Taunbinnee.

7TH.—GRAZING OR PASTURAL GROUNDS.

In the northern parts between Amherst and Tavoy.

There is a strip of country between Ye and Tavoy, and another of greater extent between Ye and Lamain and to the N. E. of that last village, which consists of a number of successive small hills composed chiefly of old red sandstone impregnated with much iron.

There the luxuriant growth of trees ceases; the number of smaller plants chiefly of the numerous creepers and climbers diminishes. But instead of these every where the woods had been burnt or cleared, a thick gazon of tender grass springs up and covers the surface.

In the southern province of Mergui there are no tracts of equal nature; the moisture, divided more equally throughout the year, is more congenial to the development of vascular plants.

But in the province Ye, chiefly towards the inlands near the Lamain district, the tender grass attains the height of 12 to 15 feet; any demand for hay for the Military Commissariat at Madras could be supplied from thence at a cheap rate: with the assistance of some hydraulic presses it could be formed into bales, fit for shipping.

8TH.—UNPRODUCTIVE HILLS.

Their composition and productions.

A portion of the land just now described is deprived of humus and other decomposed fertilizing earths, instead of which bare siliceous fragments cover the surface—such land produces but dwarfish bamboo and a comparatively small number of trees, whose growth is checked. Detached patches of several miles length but of small breadth are to be found between Ye and Tavoy, and between Pim-bioo-ghee Pai and Palou. These hills are always near the sea. In the interior none of this description are to be found.

Mergui Island.

Approaching towards the south, the hills of the same nature become more productive on account of the more equal division of moisture throughout the year. Part of the Mergui island near the town is composed of a succession of such hills, which are however covered with short verdure, chiefly juncaceous plants throughout the year.

Hills containing iron near Tavoy.

The iron hills near Tavoy belong to the same division. These are very dry, barren and covered chiefly with thorny brushwood.

9TH.—BAMBOO LANDS.

Many of the smaller hills are not formed of sandstone, but of argillaceous schist covered with the humus which has been deposited by lapsed centuries; formerly occupied by forests, which subsequently have been pretty well exterminated by the intrusion of bamboo.

They are widely spread between Ye and Tavoy where I travelled two days through an uninterrupted bamboo forest. They occupy on the Attaran the space between the second and third range; towards the south, the quantity of bamboo lands of this description diminishes, the bamboo retires then more towards the interior, and occupies greater heights. In that high table land which contains the coal fields, bamboo forests spread over a great extent of the country. Changing localities towards the south.

10TH.—HIGH TABLE LANDS.

These do not exist at all in Amherst Province, which is a low plain, encircled to the north and east, by an extensive chain of mountains. High table lands.

High table lands do not exist in Ye Province, which is an accumulation of mountains and valleys without plains, except those towards the sea shore of little elevation.

High table lands begin in Tavoy Province near Kalley Aung, and the river Tenasserim runs through part of them. The general notion of a high ridge of mountains forming the eastern frontier of the British possessions, as delineated in all known charts, is incorrect. The highest range in the southern provinces is 30 to 40 miles from the sea coast, and then descending towards the east and traversing a hilly country we arrive at an elevated high land, which extends sometimes beyond the supposed British frontiers, or terminates in another hilly country ascending towards the east. Begin in Tavoy Province. Their extent.

Isolated mountain systems spring up in these elevated plains, and in many parts they are diversified by valleys and dales, but the chief feature of the country, Tenasserim, is a high table land.

The coal is imbedded in it, and many more fields yet undiscovered will probably be found in this division of lands.

11TH.—MOUNTAIN LAND.

Except part of the Province of Amherst, the rest of the Provinces may be called mountainous.

There are three parallel running ridges in a direction from N. N. W. to S. S. E. which give the general features to the country. Mountain ridges.

Their height varies from 3000 to 4500 feet the last range, meanwhile the nearest to the sea-coast scarcely ever exceeds 500. Their height.

The mountains decrease in height towards the southernmost parts.

These great ridges give rise and birth to the different other sections above alluded to.

Highest isolated mountains.

Amongst the isolated mountains, the Zadee, and Nor-bos-lay-town, between Tavoy and Ye, are the most conspicuous ; the Dzay-town, 30 miles to the east of Ye, is the most famous, sacred and mysterious of all. The high ridge of mountains, parallel to the Paloak river between Tavoy and Mergui, is the highest; none however, as far as I had opportunity to ascertain, higher than 5000 feet.

The mountains forming the N. E. frontier of Amherst Province, the Elephant tail mountains, are much more elevated.

The highest stack of mountains is beyond the British territories in the parallel of the Three Pagodas.

Sublime scenery.

One of the most beautiful sights I ever enjoyed was visiting that famous pass. It is a high table land, upon which again a number of mountain ridges is planted. I ascended one solitary limestone rock, lying to the north of the three heaps of stones indicating the former site of the Three Pagodas. The view from thence, though exhibiting no snowy peaks or glaciers, was, in many respects, grander than the scenery in Switzerland, in the Appenines, or the Jura Alps. It was an unbounded view, ridges after ridges in succeeding lines running in the same direction, emerged one above the other: in the Siamese territories, I counted eight different chains, and these were either uninterrupted ranges or broken fantastically-shaped heaps of intermixed limestone, cones and peaks, presenting an amphitheatre of sixty miles in breadth, the horizon crowned by a faintly contoured ridge of about 11,000 feet elevation, beyond which I fancied that the valley of the great and mysterious Menam must wind.

III.

RIVERS AND THEIR GEOGRAPHICAL DISTRIBUTION.

The river territories in that tract of country which I visited are four. Division of river territories.

1st. Territory of rivers, running towards the great plain of Amherst Province.

2nd. Territory of rivers discharging themselves directly in the Bay of Bengal without combining previously—(viz. separated river territories.)

3rd. Territory of rivers forming the Hinzai Bay.

4th. Territory of rivers originated beyond the great ridge of mountains situated within the British territories.

1.—RIVER TERRITORY.

The Attaran.

The Attaran is the only river of consequence, which running in a direction from S. E. to N. W. empties itself before Moulmain in that great sweet water basin at Martaban, formed by the confluence of the Salween, Gyne and Attaran. Course of the Attaran.

The river Attaran is a deep but narrow river, forty miles above Moulmain, accessible to vessels of some burden. Higher up, divided into two, of which the largest assumes the name of Zamie-Khiaung; it remains navigable for 40 miles more, but the strong current renders the ascent difficult. Assuming the name of Zamie Khiaung.

Beyond the Nat-Khiaung, very seldom any body navigates except the cutters in the teak forests, for the best teak is floated down from the upper Attaran and its tributaries above Nat-Khiaung. The river then divides into several branches, of which I visited one after the other, without, however, following the course of each separately. There are five rivers, each 30 to 40 yards broad, but shallow and fordable, which come from the mountains to form the Zamie-Khiaung. Seldom visited beyond Nat Khiaung.

They have separate names, but these are varying and used promiscuously, and generally they are designated by the names upper, lower, higher, first, second, Different denomination.

last, Zamie-Khiaung. The branch called the Mikeli-Khiaung is about 60 yards broad and very rapid. It is considered the source of the Attaran, flows through the pass of the Three Pagodas, and is navigable for canoes to the foot of the pass.

Its source.

The length of the course of the Attaran has been always undervalued. Most maps fix the source of it near the Three Pagodas within the British domains, but it cannot be less than from 20 to 30 miles further to the eastward in Siam, and cannot be far from the geographical river territory of the Menam. Ascending the highest mountain near the Three Pagodas, I saw distinctly the valley of one of the Attaran tributaries some twenty miles off.

Extent of the British possessions to judge from river territories.

If the source of the rivers discharging themselves into the Bay of Bengal shall be considered as the frontier of the British and Siamese territories, then it is a great probability that the first ought to be extended from 30 to 40 miles farther to the eastward, but this is a question which probably will not be agitated before the lapse of several generations. These sub-alpine countries are now entirely uninhabited, claimed by nobody, and a degree of uncertainty will prevail for a long time respecting the boundaries of the east and west.

2.—RIVER TERRITORY.—1ST. THE YE RIVER.

The sub-alpine part of the country before mentioned, stretching to the eastward of the Three Pagodas and some 60 miles to the south, is apparently the most elevated stock of mountains.

Common stock of mountains containing the sources of the most important rivers.

From this descends four considerable rivers, discharging their waters into the Bay of Bengal, two of which belong to this division, (of the Attaran we have already treated) and the last belongs to the inland territory of the Tenasserim.

The Ye river has its source not far from that of the Attaran, equally beyond the supposed British boundary. It receives the greatest part of its tributaries from the north and east of Ye, few from the south, its course is comparatively short, and it is only navigable within the influence of the tides.

2ND.—THE TAVOY RIVER.

The Tavoy river has for a length of time a narrow valley of its own and descends from N. N. E. to S. S. W. gathering its tributaries from the mountains on both sides.

Course.

Its course in the upper part is very much obstructed—it continues to be navigable for large boats, some thirty miles above the influence of the tides. At Tavoy it is between 300 to 400 yards broad and navigable for vessels of two hundred tons burthen. Below Tavoy it extends rapidly and enters the sea at Tavoy Point, having attained a breadth of several miles.

3RD.—RIVERS TO THE SOUTH.

The number of rivers to the south of Tavoy is great, but few are considerable and none of them comes from a distance farther than fifty miles. Those which unite themselves with the Tavoy river in its lower course are the subsequent :—

a. The Wambaloo, following a very tortuous course through the alluvial plains near Tavoy, and enriching the rice fields annually by its inundation with highly fertilizing deposits. Wambaloo.

b. The Taunbiauk river, which has its source in the Kiauk-town stock of mountains and runs through the fertile valley of Taunbiauk. It is there formed by the confluence of numerous river torrents, such as the Taunbiauk.

Pioo-khiaung	Man-than-khiaung
Pai-kay ,,	Kjauk-taung ,,
Wun-khioun ,,	Wa ,,
Ja-nee ,,	and others.

The Taunbiauk river has at its mouth the width of about half a mile, and is at high water navigable as far as the valley of Taunbiauk. It is of great advantage to the inhabitants of that part, they being able to bring upon it all their produce into the Tavoy river and from thence to the bazaar of Tavoy. Importance of the Taunbiauk river.

Between the Tavoy and Taunbiauk rivers are several others of 100, 200 and 300 yards width in the alluvial plains, all with extensive mud banks, which render their appearance at low water very odious. Other rivers.

Over all these wooden bridges are erected, but most of them in a bad state. The travelling by land with beasts of burthen is on this account exceedingly difficult and dangerous, as they cannot be permitted to pass over the decayed bridges.

At present however bridges are not much required, as few people travel to any considerable distance by land, but always along the sea coast in boats, all villages being built on navigable rivers and creeks, and the inhabitants of two villages in direct line, scarcely two miles distant, communicate with each other by means of canoes, preferring to make a circuit of twenty miles to the direct foot paths. All produce is in the same way transported. The most considerable of these rivers between the Tavoy and Taunbiauk river, are the Tha-pin-khiaung and the Pjow-khiaung, but the number of all is nine. Scarcity of land travelling.

From the Taunbiauk river to the Palou-khiaung, the number is more limited, but the rivers are more considerable, and generally 35 miles inland navigable for canoes. Rivers to the south of Taunbiauk.

These are the—Thanjeen khiaung,	Pa-louk-khiaung,
Pai ,,	Pjee-kja ,,
Wa do ,,	Palou ,,

The last three are the most important, I do not know the number and extent of rivers between Palou and Mergui, as I did not visit that part of the country, but went inland in search of the Great Tenasserim. I am however informed that there are some not inconsiderable streams to the north of Mergui.

3.—RIVER TERRITORY.

The Rivers of the Hinzai Basin.

Hinzai-basin.

There is a territory between Ye and Tavoy, which is peculiarly remarkable. The country slopes from all sides towards a central point forming the semicircle of a great cone, the lower part of which is a sweet water basin, which empties itself through a narrow opening into the sea.

Safe harbour.

This is the Hinzai-cove, one of the safest and finest harbours on the whole coast, provided that there is no bar at the entrance, which I had no means to ascertain. It is about 15 miles long by 6 to 8 broad, surrounded by land on all sides except an opening of half a mile breadth. The country about is entirely uninhabited, some turtle egg searchers from Tavoy come occasionally there and stop along the sandy beach lined with casuarina trees, localities which the turtles greatly like.

Hitherto unknown.

The bay has been hitherto unknown to Europeans; the survey of the coast has only been made from the sea side, and the entrance to it has probably been considered the opening of one of the numerous rivers, as the sight of the inner bay is shut out by elevated hills.

Rivers contributing to form this basin.

This fresh water basin is formed by the confluence of all the creeks between Ye and Tavoy, descending from the westernmost ranges. There is only the Hangan rivulet turning into the Ye river, and the Zadi river which empties itself directly into the sea, an exception—the creeks and rivulets concurring to form this bay are in number eighteen, their names the following:

Podain-khiaung,	Ma-gna - khiaung
Muin-daing-khia-khiaung,	Ka-nyai ,,
Da-ni ,,	Nat khi-dzjn ,,

which, all uniting before they enter the Hinzai basin, form the Majan-khiaung;

Paun-dain-khiaung,	Pa-dain-khiaung,
Mai ,,	Tzheen-tzuch-khiaung,
Tzee-goun ,,	Kha-lo ,,
Nan-ta-zoak ,,	

coming all either from the north or east; then the

Myn-tha-khiaung,	Aim-dia-zua-khiaung,
Tzeen-phan ,,	Ko-phe-rouk ,,
Tshaun-zaun ,,	

which come either from the south-east or south.

The last or Kopherouk-khiaung is the most consid[illegible]

4.—RIVER TERRITORY.

Rivers uniting themselves with the Tenasserim.

The river Tenasserim is the most considerable in the southern provinces, and that which of all others in the British possessions on the coast runs through the greatest extent of land; it ought to be therefore the most important, yet it is of all the least known and its whole length as far as it is navigable, has never been visited by any European. Tenasserim river.

The reason is that it is an inland stream, running 300 miles through mountainous country, formerly quite unfrequented; the lower part however on account of the eminent fertility of the soil begins to be cultivated since the British occupation by Kareans, Siamese and Burmese. Excepting the site of the old town of Tenasserim and the new settlement of Metamio there is properly speaking not one single village along its whole course—Mergui itself is situated at the mouth of one of its branches. Its lower parts begin to be cultivated.

I had an opportunity to visit its higher parts to the distance of 150 miles from the sea, ascending also 100 miles of the Little Tenasserim, which is another large stream uniting with the former at the site of the old town of Tenasserim.

The Tenasserim itself is formed by the confluence of the Bain-khiaung, and the Kamaun-theng-khiaung at Metamio, which is a Christian Karean establishment founded by the American Baptist Missionaries four years ago, on the site of an old walled Siamese town, which according to tradition was the capital of an independent state. Rivers forming the Tenasserim.

A.—THE BAIN-KHIAUNG.

The Bain-khiaung has its origin in latitude 13° 31′, in one of the high mountain stocks which traverses the country from N. by W. to S. by E. Origin of the Bain-khiaung.

The river after being swelled by sixteen mountain torrents (running the whole course from S. to N. by W.) meets at Metamio lat. 14° 11′ another stream the Kamaung-thueg-khiaung, which comes almost directly from north and forms in conjunction with the latter the Upper Tenasserim. The Bain-khiaung before Metamio has the breadth of about 55 yards at low water.

The names of the rivulets running into the Bain-khiaung, beginning from its source, are the following: Rivulets forming the Bain-khiaung.

1. Left side ..... Laka-phioo-khiaung.
2. Do. do. ..... Ye-poo ,,
3. Right do. ..... Kiauk-town ,,
4. L. do. .... Tha-phioo ,,

5.	Right side	....	Tha-pl-pho-khiaung.
6.	Left do.	.....	Mounai-too ,,
7.	R. do.	.....	Jance ,,
8.	L. do.	....	Zheen-zuay ,,
9.	,, do.	.....	Khiauk-po ,,
10.	,, do.	.....	Pya ,,
11.	R. do.	.....	Haing-kamait ,,
12.	,, do.	.....	Ye-poo-tha ,,
13.	L. do.	.....	Taung-to ,,
14.	R. do.	.....	Ja-nee ,,
15.	L. do.	.....	Gna-zuoy ,,
16.	L. do.	.....	Tida ,,

B.—THE KAMAUNG-THUEG-KHIAUNG.

Supposed source.

The Kamaung-theng-khiaung has never been traced to its source, which is supposed to be to the north, not far from the high stock which gives birth to the Attaran, Ye and Tavoy river in the latitude of Ye. It is asserted by natives (Kareans) that it runs parallel with the Tavoy river, both being divided only by a moderately elevated range of mountains. I ascended it twenty miles up from Metamio and found it an insignificant shallow river scarcely navigable for boats at low water, but very much extended during the monsoon.

Country where the two rivers unite.

The country where these two rivers unite forming the Upper Tenasserim, is mountainous; the river is there enclosed by steep banks and hills of moderate elevation, the river bed is a succession of rocks and rapids. There is plenty of water even in the dry season, but the navigation is at present very intricate. Kareans are known who have passed down its whole length upon rafts and were twenty days in reaching Mergui.

Tributaries.

The tributaries which the Tenasserim gets in its higher part, are not known but are probably insignificant, for 80 miles below, in latitude 13° 12′, where I penetrated from Mergui, I found the mass of water scarcely augmented. The first 35 miles from Metamio the river runs almost constantly east, but turns afterwards directly to south uniting with the Little Tenasserim in latitude 12° 5′ from where it turns in a N. W. direction towards the sea for the remainder of its course, which is 41 miles.

THE LITTLE TENASSERIM.

Source of the little Tenasserim.

The Little Tenasserim comes directly from S. E. It is at the village of Tenasserim 118 yards broad, and has been traced by me almost to its source, a distance of about 116 miles.

The chart of it made by Mr. Hutchinson of the Madras Artillery, gives a correct outline of it on a large scale.

This chart having been forwarded with my report about the coal, a description of it would be unnecessary.

The numerous mouths of the Tenasserim river will be soon perfectly known, Capt. Lloyd, the H. C. Surveyor General, is at present occupied in surveying them and farther remarks here would therefore be superfluous.

Survey of the mouths of the Tenasserim.

The Tenasserim will become in time the most important river in the provinces.

The reasons why the Tenasserim will be in time the most important of all the rivers.

a.—Its upper part chiefly round Metamio is rich in tin ore, which will and must become an article of exportation, and it will be found cheaper to bring it the long distance by water to Mergui instead of transporting it by land over the high mountains through the difficult passes to Tavoy.

a. Containing a tin ore.

b.—Its lower tributaries contain gold. Though it may be a doubtful question, whether the washing of it can be a profitable employment, yet no doubt the mere knowledge of the existence of gold will probably attract adventurers to it.

b. Gold.

c.—The Tenasserim is the only river, on the banks of which the Sapan-wood forests occur (within the British boundaries). It is but a small slip of land which produces spontaneously the valuable dye wood, the part 13° 30′ being the southern and 14° 4′ its northern extremity. The reason why it should just select this intermediate tract is not obvious, as the nature of the country seems to be pretty uniform from Metamio to the Ye-khiaung, where the country begins to be more level.

c. Sapan-wood.

Except the solitary Karean wanderer who is well acquainted with its unenlivened banks, the Sapan-wood cutters are the only people who ever ascend the stream so far, and this only during the short time from June to September when they float the wood down on rafts. A more improved system in cutting and cultivating of the Sapan-wood on places where it has been formerly growing and is now almost exterminated, will render the Tenasserim much more important.

d.—The tallest and best timber grows on its banks throughout its extent. When the time will arrive that the value of the timber will be more understood, it is of course natural that localities affording facilities for transport will be the first selected, the long course of the Tenasserim will afford in the first instance inexhaustible supplies.

d. Excellent timber.

e.—The fertility of the banks between the Ye-poo-khiaung and the old town of Tenasserim, and on both sides of the Little Tenasserim, renders that part important to persons desirous to engage in agricultural pursuits, it is considered by the Burmese and Kareans themselves the most fertile part in the province, the Taunbiaun valley excepted. Yet it has been entirely deserted. Before the occupation of the country by the British, nobody dared to settle there, being liable to lose not only the fruits of his exertions, but to be himself kidnapped by the Siamese and sold as slave.

e. The banks being highly fertile.

Recently chiefly since the last 4 to 6 years, large tracts begin to be cleared, not only by the Kareans who are here to be considered as the forerunners of human

enterprise, not only by the Burmese who are the naturalized population, but by the emigrants from Siam who settle all in this district, and also by some of the enterprising Chinese who have penetrated so far, finding agriculture even more profitable than the lucrative trade which they hitherto exclusively monopolized on the sea coast.

f. Passage for the coal.

f.—Finally, the discovery of coal on the banks of a tributary of the Tenasserim must soon change the lower parts of the river between Tenasserim and Mergui, now almost uninterrupted forests, they will change into scenes of human industry; the number of men which the coal transport will require, the mass of victuals which these will consume, and perhaps the opening of a new communication of mercantile importance with Siam, will produce these changes.

It has therefore the appearance that the Tenasserim, hitherto the most neglected and most unknown of the great rivers, may become in course of time the best explored, the best cultivated, and most productive part of the southern provinces.

River territory to the south of Mergui.

There is another river territory to be mentioned which comprises the streams discharging themselves into the sea between Mergui and the St. Mathew's river, the southernmost boundary of the provinces, of which however I am unable to give any details, having not yet visited that part of the country.

IV.

GEOLOGICAL NOTES.

Great part of geologists acknowledge now the fact in the history of the earth, Geological theories.

a.—That there have been long periods of comparative repose, and that there have been periods of extraordinary violence or revolutions, during each of which a great number of mountain chains have been formed ;

b.—That all the chains thrown up by a particular revolution have a uniform direction, running parallel to each other, even in remote regions ;

c.—That the instantaneous elevation of great mountain masses must create a violent agitation of the waters, and may be the reason of the dismemberment of a part of a continent and of the formation of an archipelago of islands.

The country from lat. 17° to lat. 11°, which I visited, presents a most interesting phenomenon, namely, that almost all of the great mountain ridges run in one and the same direction from N. 10 W. to S. 50 E., or in the same direction in which we find the course of the Peninsula indicated in a common map. Direction of mountain ridges.

These mountains are long stretched ridges, frequently interrupted ; of different height, and sometimes double, triple, quadruple and more, with intervening valleys or table lands.

Most, perhaps all, of these mountain ridges belong to one and the same period of formation. They are either primitive or transitive rocks, chiefly gneiss, mica schist and hornblende schist, as far as about the 14th degree of latitude, and then exhibiting either a jointed and slaty structure, or thick beds resembling strata of deposition, transitory greywacke either in thick beds, viz. oldest fossilliferous group, or passing into the flaggy beds. Their formation.

I regret that I could not visit either the sea coast or the islands, I am therefore totally ignorant of their formation. Archipelago of Mergui.

The Archipelago of Mergui composed of about 2000 islands, forms one of the most beautiful scenery imaginable, and in variety, can only be surpassed I think by the Archipelago of Korea. Almost all the islands are uninhabited, none cultivated, and all except some solitary rocks, overgrown with timber. It would be interesting to have this quite unknown labyrinth examined, and it would be

interesting to determine if these islands are the upheavings from the sea during one of the great revolutions, or if they are the detached remains of a former main land.

Volcanic action.

That volcanic action must have affected in recent times this part more than once proves the neighbourhood of that mighty volcanic band of the Moluccа and Sunda Islands, which band begins somewhere to the north of the Phillippines, (perhaps as high up as the Aleutian Islands) occupies Gilolo, Booro, Ceram and Banda, sends a branch towards New Guinea and passes over Flores, to the probable central stock at Sumbava, from where, after passing through Java and Sumatra, it extends to the Bay of Bengal, and apparently loses itself in Barren Island, which stands a constantly burning volcano, an awful sentinel in the parallel of Mergui, scarcely five degrees to the west from that town, or it goes, as the late Mr. Foley has shown, over to Arracan, and from thence up to Assam. It is impossible to imagine that this immense volcanic band should have no direct influence upon the Tenasserim provinces. I have not observed in any part of the provinces any recent plutonic rocks, nor have I heard of earthquakes and their devastations. This is however no proof. The smallest part of the country is geologically examined, the greatest part of the country uninhabited, and the people have no written historical records, nay traditions, older than three generations, are very seldom met with.

Hot springs.

But I suppose that continuing volcanic action manifests itself indirectly, but clearly enough in the existence of the numerous hot springs met with throughout the country. There are eighteen places known to me where hot springs exist. The most considerable are those near the Attaran, those near Pay, those near Metamio on the Upper, and those on the Ye-pu-kianng on the Lower Tenasserim.

But they are to be found throughout the country. Frequently in wading through small rivulets on my overland journey when in want of a better road, the barefoot walking people exclaimed suddenly—that the water got hot. It was in consequence of small hot springs penetrating through the rocks, the warm water mixing with the cold, that stream became tepid to some distance, until it assumed again its former degree of temperature.

HOT SPRINGS ON THE ATTARAN.

Examination of the hot springs on the Attaran.

There are ten hot springs or rather hot water ponds, of which I could only examine the nearest, as the access to the others was through deep water of 130° Fahrenheit. This one was a semicircular pond of about 50 feet in circumference. In one place it was 85 feet deep, but I could only measure the depth round the borders. It was perfectly calm, except in one or two places, where a slight ebullition took place, small thin patches of siliceous incrustation intermixed with confervas and tremellas swam on the surface. The air above the spring was 97½°, and the water itself 146° Fahrenheit, notwithstanding this high temperature, the borders are deeply covered with vegetation, and a species of ficus had annually its roots in the water. The story however of fishes being found in the water seems to border on the fabulous.

The ground round the springs is strongly impregnated with iron, and the water which runs over the ochry mud has a strong styptic taste. The temperature of the muddy ground at a quarter of a mile from the springs, was raised more than ten degrees, and near the springs it was almost too hot for the barefooted coolies to bear it. The quantity of carbonic acid which the springs evolve, seem to render (notwithstanding the excessive heat) the neighbourhood peculiarly adapted and susceptible to afford nourishment to vegetable life, hence the increasing luxuriance of the vegetation almost impenetrable, approaching the hot springs. Evolution of carbonic acid.

The hot springs on the Attaran are the only instance where I met them in a plain perfectly level, all the other springs I visited were in the interior, on the slopes of what I called inland basins, in more mountainous regions or on the banks of torrents and rivulets.

All the springs which I examined were uniformly composed and belonged to the class of sulphureous mineral waters tinged slightly with Chalybeate like the water of Brighton. The springs on the Attaran approach in their composition nearest to the celebrated waters of Tœplitz. The greatest difference in their general composition consists chiefly in the absence or presence of quantities of the sulphates of magnesia and lime. Chymical composition.

We may be inclined to believe either the central heat or the chymical agency or electricity as the source of volcanic heat, the hot springs are the manifestation of their existence, and experience has placed it beyond doubt that an intimate connexion exists of hot springs with earthquakes and volcanic eruptions. (N. B. For instance, the intimate connexion of the Spradel at Carlsbad in Bohemia with the eruptions of Vesuvius.) So we may assume as correct that the numerous hot springs in this country are in intimate connexion with the volcanic system which pervades the Indian Archipelago, and to use an ordinary but intelligible phrase, that they are some of the distant air holes through which the constantly regenerated, either gaseous or precipitated, substances escape. Theory of these thermal springs.

That earthquakes are either unknown or exceedingly rare in these parts is no proof either of the absence or distance of volcanic action, for only obstruction to the discharge of volcanic heat and to the exit of highly expansible gases may give rise to an earthquake or eruption.

How many vents for the discharge of gaseous bodies may yet exist unknown in the provinces, and how many more may exist in the adjacent seas?

The progress of geology has pretty accurately ascertained that mineral springs in general are the most abundant in volcanic regions, and the general origin of thermal springs seems to be that they are originally columns of steam condensed before reaching the surface by coming in contact with other strata filled with cold water. Intimate connexion of hot springs with volcanic action.

The columns of steam however, can only ascend in parts where at a certain depth subterraneous heat is active, that is, within the territory of volcanic action; it seems to me therefore a proof that the volcanic action, known to be constantly operating in the neighbouring Moluccas, extends under the surface over a great part of the Tenasserim provinces, the most northern thermal springs being in latitude 16° near Amherst.

Use of the thermal springs.

In a civilised and more densely peopled country these thermal springs would be of importance, and afford medical assistance to multitudes. But here centuries will elapse before any use of them will be made; much more as their situation is generally far inland, generally in sequestered spots in the depths of the forests, where very seldom any human being penetrates.

Medical properties.

Their medical properties would render them excellent remedies in a number of cutaneous diseases which are common among the natives, chiefly among the Kareans, probably contracted by the effects of uncleanness, as they are accustomed to wear the same cloth without ever removing or washing it until it falls in rags. Liver complaints, in this country however by far less frequent than in Hindoostan Proper, would equally find a powerful remedy in them.

The most important those near Amherst.

The hot springs near Maulmain on the Attaran will probably be the first which will excite attention, and if Amherst should be selected as a resort for invalids from India, they could easily be turned to advantage.

In a direct line, they would be only four to five hours distant, and a road could be cut through the country without difficulty, so that patients could be removed there, and could bathe in loco.

Effects taken internally.

Their effects, taken copiously internally, ought to be tried, and it would perhaps be no bad speculation for an enterprizing man to bottle the water and bring it to Calcutta and Madras, from whence it could be easily diffused throughout the country for the benefit of those who labour under liver complaints.

Increase of land.

On a large scale.

It is unnecessary to mention the vast deposits on the deltas of rivers in general; the power of running waters carrying with them every day acres of land being sufficiently known to produce vast extensions of transported land. In this part of the globe these phenomena operate on the grandest scale. The deltas of the Ganges, Burhampooter, Irrawaddy and Maulmain rivers are constant demonstrations of the increase of alluvial territory.

But small rivers form their deltas as well as streams which carry the deposits thousands of miles. Small rivers which, in other not tropical parts, would scarcely effect a visible change on their mouths for centuries.

Marine forests. Agents of increase of land.

The reason of this operation is an agent unknown to temperate climes, and hitherto not sufficiently studied and appreciated by geologists—the marine forests. (See natural division of the country *d.* Mangrove belts.)

A peculiar natural family of trees and shrubs (though belonging, if their actification be examined, to different botanical families) occupies the shores of e sea coast near the deltas of the rivers.

They are distinguished from all other vegetable productions.

Distinctions of the trees and shrubs constituting the marine forest.

a.—They grow only in brackish water, never farther than the influence of salt water reaches (the lower part.)

b.—They want to be daily overflown by water.

c.—They have all thick succulent or coriævus leaves.

d.—They are evergreens.

e.—If burnt to ashes, yield, instead of potash, soda.

f.—Contain in their bark a strong astringent matter.

g.—They have from other plants differently formed roots from other plants, which extend above the soil, and some of which grow upwards instead of downwards.

h.—If dried like other botanical specimens they fall in pieces.

[N. B. In species they are the most numerous near the Equator, are the chief walls which surround a great part of Sumatra, and are still numerous on this coast. (I have collected hitherto 17 species): at Maulmain the number of species diminished, but not so the number of individuals ; the Sunderbunds near Calcutta are much poorer in species.]

How do they arrest the deposits ?

These peculiar productions (some of them 10 inches in diameter whose roots stretch as far as 40 to 50 paces from the trunk) are the natural and indeed the best fortifications of the terra firma in low ground, and they are the chief reason of the accumulation of new land near the sea, growing thickly together, generally impermeable to men, each species displays its roots under a peculiar angle or curve, forming a labyrinth of holes and passages at low water several feet above ground. The mud carried in suspension by the stream down is caught in the net work, where the currents are interrupted, and is deposited. This daily repeated phenomenon produces a vast quantity of sediment, which increases the land, and the mangroves operate so quickly that one generation is sufficient to perceive the changes.

Different operation in not tropical climate.

In other not tropical parts the sediments of the rivers are carried into the sea and form the extensive banks, which in narrow inland seas will terminate as in the German or Baltic sea to form extensive banks, to render other parts shallow, to create partly morasses and finally to fill up whole estuaries.

Meanwhile here the marine forests do not permit much of the suspended particles to escape, and remain in the same time the best fortification of the sediment.

Final contribution when decaying.

But these trees contribute not only to form swamps and morasses, they tend to create fertile and solid land. The violence of the monsoon carries annually from the higher lands a mass of vegetable and mineral debris, part of which covers the first deposits of silt. The soil loses gradually its saline properties the more it is covered by detached humus. Terrestrial plants begin to thrive and give an impulse to the generations of more humus, and the marine forest trees, the first generations of the new lands, die. They seem to have fulfilled their destination, and when decaying, their fallen trunks, their rotten roots give the last tribute to that work, for the accomplishment of what they seem to have been exclusively created.

GEOLOGICAL STRUCTURE.

Primitive or transitive formations.

The higher mountains of Tenasserim belong chiefly to the primitive or to the transitory systems, being either but rarely unstratified rocks or inferior stratified non fossiliferous, or belonging to the grauwacke group. The carboniferous group is confined to the parts containing isolated mountain limestone chain ; coal measures have been discovered in the southernmost parts.

Granite.

Unstratified granite, comparatively speaking, is not common. Between Ye and Tavoy large tracts of Sienite are to be found, and in the granite district at the Hinzai basin short rocks constitute important masses. Beautiful pieces of tourmaline, resembling those from St. Gothard, are found there.

The Diallage rocks, so common in Ava Proper, have not been traced to the southward. Greenstone is on the confines of Amherst and Ye Province, in large masses, where chiefly the Zhen-taun district, contains much of porphiritic greenstone.

No unstratified rocks belonging to the plutonic section have in any part been seen by me.

Inferior stratified rocks.

The same rocks which occupy such a considerable area in Central India, and are the chief constituents of the Himmalayas, are here the most common. They seem to be the chief basis of passage. Ceylon, as far as it is known, is chiefly composed of them.

Gneiss is the most common in the most elevated parts.

The Na-bos-lee chain towards Kallee-oung is composed of protogyne, the substitution of steatite for mica, is alternating. Mica slate is almost as common as Gneiss. It is the chief constituent of a great chain towards the Three Pagodas, and of the Malne mountains.

The eastern ranges toward Thum-lo, between the Kamaung-thueg-khiaung and the secondary ranges between which the Baing-khiaung is included consist exclusively of hornblende slate.

Talcose slate is throughout, but in detached patches, visible.

Argillaceous or clay slate of this and of the grauwacke series is a common companion in the valleys and declivities through the province.

Chlorite slate is more in the northern parts.

Quartz rocks occur interstratified with the above mentioned rocks, chiefly with mica slate and gneiss. They appear isolated between Tavoy and Metamio, where they form a barren ground of several miles extent. Quartz rocks.

N. B. It has been said that formerly gold was found there, and it is not improbable that the quartz is auriferous. I found chrystals of iron imbedded, but no gold.

The top of the Zadee-taung between Ye and Tavoy, contains tinge masses of quartz. This is the only mountain known to me, which has a bare top, the forests formerly covering it, having accidentally been destroyed by fire in consequence of lightning. The white masses of quartz are visible from the sea at a distance of 30 miles. On the top of the Zadee-taung.

A great part of the steep banks of the Tenasserim, consists uniformly of grauwacke slate and transition of limestone, as far as from the Na-tha-mi-khiaung to the Ye-poo-khiaung, lower down the territory belongs to more recent formations. Grauwacke.

To examine the country geologically it would require years. The difficulties encountered cannot be imagined by a European or even by an Indian, who is accustomed only to scenery where trees are either out of the question, or welcome ornamentally. Neither the Nilgherries or the Himmalayas offer great difficulties to the observer, but here where a bare rock is one of the greatest rarities, geology can only be prosecuted along the banks of steep rivers and traversing the fissures created by mountain torrents chiefly after the monsoon. Difficulties of examining the country geologically.

V.

ORES AND OTHER MINERAL PRODUCTIONS.

Great mineral riches.

In a country which is chiefly composed of primitive, transitive and secondary rocks, the occurrence of ores is to be expected in greater abundance. The knowledge hitherto obtained of its mineral riches, corroborates sufficiently the supposition, how much more is to be expected from a thorough investigation.

IRON.

Iron the most common metal.

Iron undoubtedly is the most common mineral throughout the provinces, being found in one or the other form almost every where. The quality of iron however improves in the southern parts, and the sites of iron ore are much more favorably situated than those indicated in my first report from Amherst Province.

Its territory.

The chief iron territory is between Ye and Tavoy not far from the sea coast, in the tertiary hills. The ore is in manifold forms, beginning from red ochre to the solid loadstone rocks. Seventeen localities have been noted down by me between Maulmain and Tavoy. The best however of all in point of quantity, quality and locality, is the iron ore near Tavoy, an hour distant from the town, on the road from Na-bos-leeyua.

Forms.

It occurs there in two forms. 1.—Octohedral, common magnetic iron ore. Massive in granular concretions, crystalized, splendent, metallic, highly magnetic with polarity.

It occurs in a bed of unknown magnitude, a block protruding above the ground, is 6 feet high and 15 feet in diameter at its base.

The existence of this ore has been known to the Burmese before, but as much as I know, has never been worked, its magnetic properties have been considered a matter of mystery and curiosity.

It is known that this iron yields the best bar iron, and that the per-centage of ore is the highest known, being considered peroxyd. 69 and protoxyd. 31, yielding at an average 85 to 87 of smelted iron.

Great bed of rhomboidal iron ore.

Not far from this is another bed of iron of apparently great magnitude, having been traced by me over a considerable surface, in fact it seems to constitute entirely a hill of 40 feet in height, 400 feet in breadth, and 2000 feet in length.

Rolled smooth pieces from 2 to 20 pound weight are seen scattered over the ground. It appears in another form from the first, i. e. massive rhomboidal iron ore.

The chain of lower mountains, which runs along the sea coast to Tavoy Point, contains throughout iron, chiefly in the forms of prismatic iron ore and in the ochry compact and fibrous form. Other forms.

Brown clay iron and conihoidal log iron ore is the most common in all the tracts from Ye to Mergui.

Red ochre is in several places on the Tenasserim. To the south of the Island of Madramee, veins of an iron ore occur, whose constituents are besides iron, copper, lead and arsenic.

Iron pyrites are to be found in all forms. Hexahedral iron pyrites were brought from the Islands and considered gold.

Prismatic iron pyrites accompany the upper stratum of the coal to the southward of Mergui.

An extensive vein of cellular iron pyrites occurs near Metamio. It has been suspected in the time of the Siamese to be gold, and its conversion into that noble metal has been repeatedly tried.

Of all the iron ores, that of Tavoy is the most important. The Tavoy iron the best.

The hill containing the iron is 24 miles distant from the river. The space from the hill to the river is occupied by rice fields, a few feet above the level of high water. The river itself is accessible to vessels of 200 tons burden to that place.

A canal from the river edge to the hill could be dug out with little expense and the ore transported there. On the water edge the smelting furnace ought to be established, fed either by fuel brought down from the upper parts of the river, where wood is in the greatest abundance, or supplied with coal from Mergui.

Considering all the iron localities known hitherto in India, there is none which combines all the advantages, which can be expected from a similar undertaking, in so eminent a degree.

The site of the iron ores near Tavoy just now related, renders it unnecessary to expatiate upon the other localities, as they never could compete with this.

TIN.

Tin ore is the second in importance. It is even more generally diffused in the southern parts of the provinces than iron, though in much more limited Tin generally diffused.

quantities to be had, and though generally diffused, there are not many localities in which it has been found, yielding such a per-centage which would render its working a profitable speculation.

In the northern parts tin is very rare. In Amherst provinces I found only one locality where it is disseminated.

Its geographical extension.

Its territory begins to the south of Ye from Kallee-oung; its central stock seems to be parallel to Tavoy, continuing to the south, probably extending through the whole of the Peninsula until it passes over to the Indian Archipelago, where its bank and its environs contain the richest tin mines hitherto known, for tin has been or is still collected in Mergui, Junk-ceylon, and in many parts of Proper Malacca.

A.—TIN OF METAMIO.

Sites.

The tin occurs here along the foot of a range of primitive mountains of from 2000 to 4000 feet in height, partly in the hills formed from the debris of rocks constituting the main range, partly in the alluvial soil of the intervening valleys deposited there during thousands of years, partly in the small rivulets and rivers running through the valleys and annually washed down during the monsoon.

Sources.

There is no doubt that the original sources are tin floors imbedded in the main range, though none have hitherto been discovered. This however is very little to be wondered at, as a great part of these mountains never have been visited and the tin mines do not lay openly exposed, and even if they did, the dense vegetation prevents a closer examination, and they remain hidden, unless met with by accident.

I found several times on or close to the surface a small number of quartz blocks amongst the debris of former ages, containing small tin crystals enclosed in the stony matri, but the quantity of tin contained in them is very inconsiderable.

Form and geological formation of the localities.

By far the greatest part of the tin is intimately connected with the sandy and earthy particles constituting the above mentioned hills; it seems however to be very unequally disseminated. It is not covered by a stratum of a more recent formation, but occurs in the soil on the very surface, a proof that its being carried down from the original stock continues to this day—how deep it extends is not known, but it must occupy considerable depths, to judge from the general formation.

Thickness of strata containing tin.

Some of the old pits worked in the Burmese time are forty feet deep. The tin occurs in very small grains, varying from the minutest particles to the weight of eight grains, larger pieces are very seldom met with. I am however informed that crystals of the size of a pigeon's egg were occasionally found.

Extent and aspect of the Metamio tin tracts.

This tract of country, of which the latitude of Tavoy forms the centre, is about sixty miles long and from eight to twelve miles broad, the hills containing it sometimes five hundred feet above the intervening valleys, and the whole has

the aspect of an undulatory oblique descent, the inclining side turned towards the east, the greatest part of the rivulets containing tin running into the river territory of the Upper Tenasserim. It is to be observed that in this latitude the whole of the western side bordering on the Bay of Bengal is comparatively poor in tin, which leads to the conclusion that the original beds are to be looked for on its eastern side.

Experiments, with the soil gathered in different localities (but every where collected only near the surface,) shewed a per-centage varying from one to seven per cent of tin oxyde. Three per cent is generally considered pretty fair, six and more very good, considering the comparatively small trouble and expense which its extraction causes.

Experiments with the soil.

Ascertaining the per-centage.

B.—TIN OF PALOU AND WOMBOO.

To the southward the tin approaches more the sea-coast and becomes still more generally diffused, but in the British provinces the per-centage towards the sea-coast diminishes. The extent of the two tin districts has not been ascertained. In Womboo (to the north of Mergui) a considerable vein has been latterly discovered. Occurrence throughout the same as just now described.

Tin diminishes towards the sea-coast.

C.—TIN OF MERGUI.

On the island upon which Mergui is built tin equally occurs, which has been formerly worked, and has been always considered private property or benefice of the Miocoun, or Town Governor; its per-centage as far as I could ascertain is however very small, the highest half per cent. It occurs with a white quartzous sand intermixed with large pebbles, and lower than the level of the sea.

All the hills in the neighbourhood are scarcely 80 feet high, and it remains an unsettled question, how and from whence it has been brought to this place.

Small per-centage on Mergui island.

D.—TIN IN THE COAL RIVER.

The mountains to the south of Mergui from which the river issues, which runs through the coal field, contain equally tin, and as far as I could observe, in some abundance; the per-centage in the rivulets varies from two to four, at a distance of four miles from the source. In the time of the extraction of coal, the tin of these parts will be probably turned to use.

Per-centage not yet ascertained.

E.—TIN FROM THE ISLANDS.

Finally I must mention, that tin upon the islands will probably be of no rare occurrence. I did not visit any of them, and mention only what I heard related, adding that it is very possible that some of the great ridges upon King's Island, Domel, &c., may often be the sources, without excluding however the flat islands. There are no mountains upon Mergui Island, and it is known that in Junk-ceylon the tin has been extracted from perfectly level land.

Occurrence upon the islands not yet positively known.

Outward appearance of the soil containing tin varies.

In general I observed, that the soil consisting of a brick red colour, composed chiefly of decomposed mica, the richest, the more prevalent argilla or felspar is, the less the tin occurs ; there is however no variety of soil which does not contain tin. Black humus ground is the poorest in tin ore—the mountain rice fields of the Kareans near Metamio, contain sometimes from one-half to one per cent.

Tin works in the times of the Burmese.

In the Burmese time considerable quantities of tin ore were washed out by compulsory labour, and the inhabitants of Tavoy, but chiefly the Kareans, belonging to that province, were employed to obtain it. The working of the tin for the benefit of the Burman Emperor, has been continued for several centuries, and if we may judge from the extent of so many miles where the surface has been turned up, the vestiges of which are visible in many places, it is certain that many thousands of men must have been occupied to effect it.

Burmese methods to extract tin.

The Burmese method of extracting tin is very rude. They either dig canals or rather small drains, intersecting the surface, or they form a perpendicular wall of ten or twelve feet high with a drain on its basis, or they excavate pits varying from six to forty feet in depth. The water during the monsoon washes out a considerable part of the earth from the sides, the lighter earth is carried away, and the tin, on account of its specific gravity, remains at the bottom of the drains or pits.

After the monsoon the mass remaining at the bottom is collected and, in small flat wooden vessels turned by manual labour, washed out. The tin grains, obtained by this method, are pretty well cleaned from the earthy substance.

How they work at present.

The above described methods of working are now almost entirely abandoned on account of the want of a certain number of men to work together. Some Kareans however, being on the banks of the rivulets containing tin, and some few people from Tavoy work too, but they are only occupied with the washing out of the sand in the creeks, which is less rich than the soil in the higher parts, but they do not know how to treat the latter in the dry season. I met such a party of people in the Tavoy mountains, their only machinery or instrument was a large tortoise shell. One man walked in the deepest part of a rivulet, trampled the mud under his feet, and after the stream had carried away the turbid water, he filled his shell with the fine sand at the bottom, and separated by constant turning and addition of water the lighter sandy and earthy particles from the tin ore which remained at the bottom. He gained by this in about five minutes from 20 to 60 grains weight of tin oxyde, which might contain 50 per cent. of pure metal. The people calculate that even by this very imperfect method, a man can earn about half a rupee's worth in one day, a pretty high profit ; but the people have so little inducement to gain money, that only very few occupy themselves in this way, and these I am told are elderly men, with whom it has become a habit, who, about fifteen years ago, were the Burmese Emperor's chief workmen.

Profits not inconsiderable.

People however indolent.

Quality of the tin.

The tin mines of this country form, after European nomenclature, what is called in Cornwall, stream works.

It is known that the tin obtained from these mines is the best, and the superiority of the tin from the Banka islands is to be ascribed to the circumstance that almost all is washed by stream works. For this reason the Cornish tin and that from St. Just are considered the best in Europe. From stream works.

Besides it is known that all tin occurring in tin floors is deteriorated either by arsenic or bismuth wolfram copper and iron, and the process of separation is sometimes a laborious one, requiring previous mechanical diminution, roasting, additional flux raffination, &c. while the stream work tin is generally free from all other minerals, and the whole process a simple reduction of the oxyd Compared with ore occurring in tin floors.

Amongst all the localities known to me, that of Metamio would be the most preferable for working the tin on a large scale. On account of its high per-centage, if undertaken with perfect machinery, it promises to be a profitable undertaking, it has however the great drawback, viz. that it has a tedious land carriage to Tavoy. It is about 40 miles distant from thence, and the only pass through the mountains is very rough, narrow and precipitous. Which of the localities in Tenasserim is the best. Metamio tin. Disadvantages of locality.

The construction of a road would require a great outlay. Elephants would be perhaps most advantageously employed. Metamio could furnish rice and other necessaries of life for the establishment. It is unnecessary to add that a steam engine directing the whole establishment would be of the greatest use; there is however water enough; the neighbourhood of the great chain of mountains nourishes small streams throughout the year, which could be easily united and directed to the working plan. Wood, as every where, is in the greatest abundance. From Tavoy being a seaport, the transport is of course ad libitum Singapore and Calcutta would be, for the present, the best markets. How to be overcome.

GOLD

Gold is pretty generally diffused in the country, but no where as far as I am aware in any quantity to excite the exertions or the cupidity of the natives, and the thirst after gold is much less than would be generally expected from a semi-civilized people, who always prefer becoming wealthy by a sudden effort than by continued steady industry.

The gold occurring in the country is no where found in gangs or imbedded in a matrix, but is found in the sand of the minor rivers, the primary source being in general unknown; whether it comes from the high mountains or whether it is washed out from the alluvial lands, like great part of the gold in Mexico, must for the present remain an undecided question. Gold in the sand of rivers.

In the Province of Amherst gold seems not to be found. The northernmost part in which I discovered traces of it, are the small tributaries of the Lamaing river. In the forests of Kallee-oung, gold may be plentiful, chiefly in the Siamese territories, eastward from Kallee-oung. This year the Siamese made Localities. Operations of the Siamese, near Kallee-oung.

preparation to dig gold on a large scale, and provisions of rice were laid in for several months—but whether it was really for the purpose of working gold, or pretence in order to have an advanced post, watching the proceedings in the British territories at the time of the expected Burmese invasion, I of course do not know.

I did not discover any gold in the Province of Tavoy. Its chief territory seems to be to the eastward of the Tenasserim river with its source probably beyond the British territories. Almost all the small rivers coming from thence contain gold, always however in very small quantity.

Tenasserim the only place where gold is now extracted.

The only place where hitherto gold is washed, is on the site of the old town of Tenasserim. The natives dig holes in the ground during the monsoon and clean the earth on the spot. This is therefore gold gathered from alluvial land and not from the sand of the river. The natives do not believe that it is gold in the state of nature, but think it to be the remains of ornaments of the old and rich inhabitants from the time before Alompra's invasion—accidentally finding sometimes, it is said, a small plate of gold, chiefly in the form as it is used to gild the Pagodas, by which their opinion seems to be corroborated. It is almost impossible to get information how much is obtained annually—all is conducted clandestinely and with mystery. I am however told that a person may gather during one season one or two annas weight. The Chinese in the place are very eager to buy it up.

Its value to Government.

The existence of gold mines to the State in general is of no great benefit. The easy extraction and the small bulk render smuggling exceedingly easy. It has been the case in America that, in latter times, gold mines scarcely yielded 3 per cent. to the State; it would be much more the case here where a control is almost impossible, and the Chinese are great adepts in nefarious clandestine transactions. But experience has taught, that gold mines prove ruinous to private individuals, who invest their capital in such a speculation, for it has been justly observed, that though the prizes in this hazardous lottery are few and the blanks many, the price of a ticket is generally the whole fortune of a rich man. Should localities be found which promise a quick return, there is no doubt that if once known the gold will be much earlier extracted than the valuable iron and tin, for human avidity does not often follow the judgment of sober reason; however a wise Government, wishing to encrease the capital of the country, will not give any great encouragement to the enterprize.

To private individuals.

PRECIOUS STONES.

Rubies and Turquoises.

I have not hitherto found any, but they may, I understand, be found within the Tenasserim Provinces, in the territory to the eastward of the Tenasserim river, chiefly rubies and turquoises, and are from time to time brought into the village of Tenasserim by some Karens, who are aware of their locality, and very anxious that nobody else should know it. The specimens I saw were very inferior, and chiefly a species of garnet, which it is usual to bury in the foundations of a Pagoda, in the absence of more valuable jewels.

Inferior garnets.

The proper site however of the precious stones, is said to be within the Siamese territories, in a dense jungle far from human habitations. Siamese repair sometimes from Bankouk there, and stay several weeks to wash the precious stones out of the clay, but the country around is infested by robbers, who watch the labourers and plunder and murder them frequently, if they have been successful in their researches. The place is a fortnight's distance from Tenasserim in a N. E. direction.

Mines of precious stones in the Siamese territories.

PORCELAIN EARTH.

Porcelain earth or China clay of different quality, is in several parts of the provinces to be found, but generally too much tinged with red iron oxyde.

Porcelain earth not uncommon.

On the banks of the Tenasserim, four days journey above the town, there is however a very considerable layer, partly together with quartz and mica crystals, which seem to corroborate the opinion that kaolin owes its origin to felspar, and to other minerals intimately related to it.

Lower down, another layer is to be observed, which seems to be closely allied to the China stone or Cornish stone (a dissolved and changed granite) with a mixture of very much felspar, which latter completed its metamorphosis into China clay.

LIMESTONE.

The peculiar blue limestone ridges, which ornament the Province of Amherst in such a conspicuous way, and ascend equally boldly in the great plains which border on the district of Ye, diminish towards the south by degrees, without however totally disappearing, and there is a famous limestone cave on the Tenasserim, eight days journey from the old town. Limestone for building materials is very little used, except for the construction of pagodas, (all the rest of the buildings being of wood), this, and the chunam which the people eat with their pawn, is chiefly burnt from shells found on the sea coast and on the river banks. Near Mergui there is an interesting formation, an accumulation of shells baked together, forming a considerable stratum, which when burnt furnishes pretty good lime.

Limestone disappearing towards the south.

Limestone cave.

Lime used by the natives from shells.

SALTPETRE.

The above mentioned great limestone cave on the Tenasserim, one of the most interesting phenomena of nature in the provinces, is the habitation of thousands, and perhaps hundreds of thousands of bats. Their excrements cover the ground in many places one or two feet thick, and the decay of this gives origin to the formation of the nitrate of potash. It would be no great difficulty to generate a great quantity of saltpetre by the formation of artificial compositions left to the influence of the atmospheric air (nitrieres artificielles) according to established and well known principles.

Excrements of bats in caves.

SULPHUR

Sulphur probably to be found on the volcanic islands.

Will be found in great quantities on Barren Island close to the Andamans, and upon other islands to the southward, on account of their volcanic nature, but not having visited them, I am unable to indicate the localities. Should it in course of time be considered worth while to produce sulphuric acid, the great quantities of iron pyrites could then be advantageously turned to use.

COAL.

Discovery of coal.

The researches after coal have been this season crowned with success. The comparative scarcity of available coal in India, and the annually rising importance of the material, rendered it very desirable that coal should be discovered in this country, which presents, comparatively speaking, a narrow strip of land, where land transport can no where be great, and where such an extent of sea coast permits an easy access to vessels. The geological formation of the northern and middle parts of the Tenasserim Provinces is such, that there was little hope of finding coal in them. Towards the south however, the coal accompanying formations of the carboniferous series became conspicuous, and in the lower part of the Mergui Province, coal was discovered in different localities, in systems or basins, apparently distinct from each other. It was ascertained that coal occupies a great area, for the two extreme points, where it was discovered, are distant three degrees from each other.

In the southern parts.

The first discoveries of no practical use.

None however of the first discovered localities promised to be of practical use, the quality being either inferior, of considerable specific gravity, intermixed with numerous iron pyrites, or the seams so very inconsiderable; and though there was hope that the lower strata might produce larger veins, yet the experiments would have been expensive and doubtful; but the last discovered locality combined all the desiderata required respecting quality, quantity, and easy access, only the distance from the sea coast throws some difficulty in the way, being from a river navigable throughout the year, 21 miles distant, from whence it is to the sea coast 68 miles. However, if compared with any other Indian locality, and if destined to supply the whole of the Indian seas with coal, it will be found that it carries for the present the superiority.

The last however important.

Enumeration of the localities.

The localities hitherto discovered are the following:

1. On the Large Tenasserim, nine days journey from the village of Tenasserim, near the river Nan-thari-khiaung, 1½ mile inland. Variety of friable brown coal, impregnated with pyrites, three veins in different localities,—the largest 16 inches in thickness—formation tertiary sandstone below, compact sandstone conglomerate, intermixed with large siliceous fragments above.

Discovered, 17th March 1839

2. On the Large Tenasserim, eight days journey up from the village of Tenasserim, along the banks of the river, species lignite, in ¾ inch thick

veins, altogether in sandstone below and above, undoubtedly belonging to the same system as No. 1.

Discovered, 19th March 1838.

3. On the Tenasserim above the Tarouk-khiaung two days distance, variety Bituminous shale. Large masses protruding into the river, apparently distinct from the first two.

Discovered, 14th April 1838.

4. Up the local river, a branch of the Little Tenasserim, five days above the town of Tenasserim, in a south eastern direction.

SLATY COAL. SPECIFIC GRAVITY 1.26.

A vein 5 feet thick, 240 feet long, angle 20 degrees, turning upwards a section, visible on the banks of the river formation, above gray, below black clay slate, the lowest stratum apparently resting, to judge after the general features of the country, upon blue limestone.

5. Close to No. 4, and a continuation of it, an immense coal field of either slaty or conchoidal pitch coal or English canal coal, highly bituminous without any concomitant of iron pyrites.

A succession of fifteen localities where the coal is visible on both sides of the river, which has evidently forced its way through it, turning up an angle of 25°, in most places six or more feet thick, resting before a stratum of clay slate.

Discovered, 24th April 1838.

Since that time I have been informed by natives, that not far from the localities Nos. 4 and 5, coal in two other places has been observed, and it is very probable that this coal field occupies an area of several miles, and localities might be discovered still more advantageously situated for transport.

The localities Nos. 4 and 5 being the most preferable of all respecting quantity, quality and easy access, I refrain from entering into particulars, regarding Nos. 1, 2, 3, which I suppose will never be worked, and are only interesting in a scientific point of view.

Description of the great coal field.

The last extensive coal field is from the others more than 200 miles distant, and seems to belong to a quite different system. It is situated in a high level table land, diversified by several isolated ranges of mountains from which issues the river which passes through the coal fields, and which ridges may be considered as the eastern boundary of the British possessions towards Siam.

In my precursory report to Government immediately after the discovery, I made a mistake in estimating the distance, which has been since positively ascertained by Colonel Macleod and Mr. Fell, I. N., whose chart is to be

considered as much more correct than any other. The latitude is 11° 52′ 37″, the longitude not positively ascertained, the windings of the river constitute a distance of 121 miles from Mergui—the direct distance from Tenasserim is 29½ miles, direct distance from the coal field to the nearest part of the river—where it is the whole year navigable, is 22 miles—distance from Tenasserim to Mergui by the river is, measured by Captain Lloyd, 41 miles.

About coal mines in general.

With truth it has been said, that coals are the greatest blessing to England, and that coal in conjunction with iron, form the basis of the present commercial prosperity of Great Britain. In our days their beneficial influence is equally manifest in Sweden, Germany and Belgium.

Coal mines in India.

The stagnation of commerce and manufactures in Italy, Spain and Portugal is not owing alone to political mismanagement, but equally to the scarcity of wood and absence of coal. Scarcity of that fuel in India has retarded European enterprize and checked its commercial prosperity, and it was to be feared that the high price of coal would have the greatest detrimental influence upon the beginning and increasing steam communication, which it is satisfactory to think may now be overcome. That scarcity in Great Britain in knowing that an inexhaustible supply is still treasured up in the bowels of her earth, has not yet been experienced in India; nay to this day convenient situations for the exportation of coal in great plenty, and of acknowledged excellence, remained the great desideratum earnestly wished for.

At Burdwan.

The Burdwan mines have hitherto been the only ones of practical consequence which rendered India partly independent of England, and facilitated the inland steam navigation on the Ganges, but their quality is very inferior. The quantity of ashes is between 77 to 18·4, on account of the great proportion of argillaceous earth combined with it.

For some purposes this high per-centage of ashes is perhaps of no great objection, provided the fuel is comparatively cheaper to make up the loss of per-centage of carbon; but if coal shall be employed for the purpose of steam navigation, it is of vital importance, chiefly for long passages with intervenient long stages, where the room filled up with coal is of the utmost consequence.

Cherra coal.

The Cherra coal in Silhet, as far as it is known, is, according to the last report of the Coal Committee, good; but its locality is such that it may be yet doubtful if it can be rendered available for the Calcutta market, but certainly it will not be cheaper than English coal for the Red Sea communication, and perhaps for no other part of India.

That Mr. Loch has succeeded to deliver 1000 maunds at a comparative low price at Dinagepore, is not yet a proof that he would be able to procure a hundred thousand maunds at the same price. The high mountains which must be traversed before the coal can be delivered at a navigable river, the necessity to traverse different passes where, as the report states, scarcely bullocks or mules can

be charged, but men must be stationed to receive the loads; all these difficulties are against the transport of any great quantity.

The Palamow coal locality presents almost equal difficulties, id est, a protracted land carriage over difficult ground—it may indeed in time become available and valuable for the surrounding country, but I do not think that India at large will be greatly benefitted by it. Palamow coal.

The great distance from the sea is an equally great objection to the Assam coal, even were the localities at present known better situated than they are.

All the rest of the coal localities found in India, hitherto known, are of no practical use for the grand purpose—"general unlimited supply." Some on account of their locality, others on account of the small quantity, but the greatest number on account of their quality. These can never be worked and are like the silicified lignite No. 30 from Assam. All the varieties of friable brown coal No. 36, 37, 38, the bituminous shale No. 52, &c. &c., and the greatest part of the other lignites and brown coals only for the sake of a system innumerable under the genus coals. The other localities.

Under these circumstances it will be easy to show that the locality of Mergui possesses advantages which none of the other situations can boast of. Advantages of the Mergui coal fields in preference to any other part in India.

QUALITY

Is one of the best known. Following the division of Dr. Jameson, it belongs to species black coal, sub-species canal coal, massive resinous lustre fracture, conchoidal, or even fragments trapozoidal, brittle specific gravity from 1. 24 to 1. 28. In the middle of the vein however it goes over in the sub-species pitch coal, and it is more bituminous than canal coal usually is. It burns freely, with a reddish flame, evolves a great quantity of gas, is completely free from sulphur and iron pyrites; ranking next to the Kilkenny coal, it can be reckoned equal to the best English coals.

QUANTITY.

Though the extent is but very imperfectly known, it is yet established that it contains so much that there can be no fear of exhaustion for the next century.

The thickness of this upper stratum varies from 5 to 8½ feet, taking only 5½ feet thickness per average, one acre gives 8,437.

It is sufficient therefore to state that the coal has been almost uninterruptedly traced for about 4 miles, and the supply of the upper stratum can accordingly be estimated. But the last reports of natives prove that it is still more extensive; of the quantity which the lower strata may contain, we cannot of course judge; but it is for the present of no use to know that there is much more, whilst already so

much is known, but if the upper stratum is already so rich, the lower strata must be still more so, if we are allowed to form a conclusion by analogy.

ACCESS.

The coal is near the surface, the stratum covering it does no where, as far as it is known, exceed 25 feet, in many parts it is from 7 to 12, the dip about 20 degrees. The stratum above the coal consists of

Bad slaty coal, ...	6	inches.
Grey slate, ...	6	,,
Debris of slate with coarse gravel, ...	2	feet.
Gravel and alluvium the rest.		

As long as the upper stratum is available, it seems that no expensive mining operations will be required.

In consequence of this, the complicated machinery for the removal of the water from greater depths will not be necessary ; there will be no apprehension of the bad consequences of bad weather, (bihydroguret of carbon,) for the present it would be the best to follow the strata from whence they make their appearance. For this purpose the deviation of the course of the small river (which has opened the section of the banks) into another channel would be the most expeditious. In several parts it rolls just over the coal, and when the water is removed, there is no surface at all to be cleared away.

In future, of course, the common operations necessary in every coal pit will be required in the beginning; this situation however ensures a great saving of capital.

TRANSPORT.

The river traversing the coal fields originates in the neighbouring mountains, and is at the coal fields only 15 to 25 yards broad, and part of the year nearly dry ; but during 5 months of the year, according to native reports, navigable for rafts. (The natives go annually from Mergui and Siam into the neighbouring mountains above the coal, to cut a sweet-scented wood called Kalamay, which is an article of commerce in Ava and Bankouk, and are acquainted with the navigation :) I ascended it in the month of April before the monsoon set in, on rafts, and came within 3 hours distance or about 9 miles from the coal fields.

Passing the level table land, the river enters a hilly country ; at first in a S. W. direction, and then W. by N. until it reaches another river coming from the south. From hence the river is navigable throughout the year for boats ; the influence of the tide becomes perceptible, the river having attained a breadth of 60 to 80 yards at low water, and runs chiefly in a N. by E. direction to Tenasserim : (a distance of forty miles.) Entering there the Large Tenasserim, accessible for vessels of 200 tons burden, the distance from thence to the sea is 41 miles.

There is no difficulty of transporting a limited quantity entirely by water direct from the coal place to the sea, employing in the first instance rafts made from the very extensive bamboo forests growing on the spot. The coal must then be ready for transport immediately the water rises. Should the bamboo not be sufficient, wooden planks made up in form of flats to hold a greater quantity than rafts, can be employed, but the high price of labour will render it impossible to deliver the coal cheaper than four annas and a half the maund, at Mergui, a great number of people being required to direct the rafts.

If however Tenasserim is destined, as it likely will be, to supply the whole of India with coal, these expedients will be found insufficient, neither bamboo nor wood can be found in such quantities as to float down about 50,000 or more tons per annum. The bringing back of the same rafts is out of the question, on account of the heavy expense and the difficulties in the last 50 miles; rail road or train way therefore on wooden foundations, cutting across to the nearest spot where the river is throughout the year navigable (a distance of 21 miles,) will be found the safest and in the end the cheapest.

Wood sufficient will be found every where a few paces from the road, and any iron rails required could be made from the Tavoy iron mines.

The cost of this rail or train road would not, I expect, be great, and at first might be of the rudest description, and the outlay of capital, may it be to whatever extent, would bring in a remunerating and certain per-centage. Before the rail road would be completed, land carriage in carts would be found cheaper than the transport by water, presuming that large quantities are required.

In this way any quantity of coal could be furnished at the cheapest rate in Mergui.

The country through which the road would have to run has not yet been surveyed, it is however known that it runs chiefly through plains and smaller hills.

LOCALITY OF MERGUI.

The locality of Mergui merits particularly to be examined with respect to the interior, with the view of having here a general depôt for coal.

Anticipating that comprehensive steam communication will eventually be established, the locality of Mergui is more favorable than any in Bengal, for the other parts of India cannot be taken into consideration because they do not yet furnish any available coal. If Point de Galle be chosen as the central point, Mergui can supply that depôt with any quantity in a very short time. In the favorable season the distance is only eight or ten days sail from Mergui, the steamers plying between Ceylon and the West Coast of India can, in going up to Bombay, be supplied with coal from Point de Galle, also Madras can equally well be directly supplied from Mergui, the distance being almost the same as to Ceylon.

To provide the lower parts of the Red Sea (Mocha and Judda) and Bombay with coal, it will be found that Tenasserim or Mergui coal will of course

be got much cheaper than coal brought from England; the same is to be said of the Persian Gulf, if steam navigation shall be continued in that quarter.

Whether it would be cheaper to take coal from Mergui to Suez, instead of transporting it from Cairo, experience alone can teach. I suppose however that if the newly discovered coal mines at Beyrout in Syria, continue to yield great quantities, the coal from these, if favored with the assistance of Mohomed Ali, will be found cheaper than the Mergui coal.

Should the second scheme of a steam navigation with England, via Mauritius and the Cape, come to maturity, Mergui coal can be advantageously employed as far as the Cape, at any rate it must be preferable to the proposition newly started in England to provide the Island of Mauritius and the adjacent parts with New South Wales coal.

The Eastern Coast of the Bay of Bengal of course will use only Mergui coal, because here it is in loco, but it will be also exclusively used in the Straits, and as Point de Galle is the Western central point between Europe, South Africa and Hindoostan, so Singapore is the Eastern central point between Bengal, China and New Holland: (through the Torres Straits.) It will therefore be perceived that Mergui has just that admirable situation, to be able to pour out the indispensable article in all directions, the two most important central points, Point de Galle and Singapore, being so near to it.

Further demonstration of the importance of the Mergui coal fields.

Further it may be observed:—

a.—That a renewed intercourse with the Dutch possessions may perhaps take place, the steamers in Batavia finding it cheaper to be supplied from Mergui with coal than elsewhere.

b.—That a project has been started sometime ago in Calcutta to substitute small steam vessels to the clippers carrying on the less bulky trade with China, a project promising many advantages, chiefly to the speculators in opium. The scarcity of coal has been the greatest obstacle. But in supplying the steamers with fuel at Mergui or Singapore, the difficulties are obviated.

c.—That it is possible that besides the use of steam vessels, coal may in time be exported to Madras and other parts of the Carnatic, to serve as a substitute for wood in that part of India.

d.—That the discovery of the Mergui coal will have an influence upon the price of coal in Calcutta, and although it may always be dearer than Burdwan coal, it may yet be carried there for the purposes for which only English coal can be used, and especially if coal gas is ever required. It is also expected to be of great use in the large reverberating furnaces of the Government Gun Foundery in which a strong flame is required.

The beneficial influences of the discovery of good coal for the Tenasserim Provinces are therefore apparent, another important consequence to which the discovery of the coal field on the Siamese frontier gives rise to, is perhaps the following.

VI.

OVERLAND COMMUNICATION WITH CHINA.

The question has been some thirty years ago started, how far it would be practicable, and how far it would be advantageous to establish a communication across the Peninsula at the isthmus of Kraw between the Bay of Bengal and the Gulf of Siam. The advantages for commerce by shortening the distances of communication in any part of the world require no demonstration.

Dissertation about the advantages of a shortened road to China.

The British trade of India with Canton has been deemed sufficiently important to excite the desire of having the communication as quick as possible. The question is indeed one of great importance, not only on account of the increase of commerce in general, but on account of the occasionally precarious nature of the relations with China. Speedy communication therefore between the seat of the Indian empire and that commercial emporium, must always be of great consequence. Is it desirable therefore to have a quick communication only by way of letters? or is it sufficiently important to shorten the road to China also for merchandize? In the first case, a communication overland by dhack would be sufficient, and without farther reference the shortest road will be chosen, in the second case the navigation of convenient rivers on both sides of the Malayan Peninsula, to be united either by way of railroad or canal, will be required.

The Isthmus of Kraw.

Forest, I think, was the first who recommended the Isthmus of Kraw; Hamilton was of the same opinion; and Colonel Burney was a warm advocate for that plan; all based upon the native reports, that there are two rivers running in parallel directions, the St. Mathew's or Pack-chan river, discharging its waters into the Bay of Bengal, the other the Tom-fong, running into the Bay of Siam near the Larchin islands; that at the height of the monsoon their waters almost unite, and that the distance from one river to the other never exceeds six hours walk, the intervenient tract meriting scarcely the name of mountainous.

I had no opportunity to visit the St. Mathew's river nor any part of the territory belonging to the Siamese; notwithstanding this, I venture to suggest another proposition which seems to me more advantageous.

Proposition of an overland road across the Peninsula from Mergui.

I ascended from Mergui the river Tenasserim up to the old town of Tenasserim, and leaving the large river, navigated up another river, which led me finally

to the discovery of the coal fields, which I hope will produce an entire change in this uninhabited and hitherto unvisited country by Europeans. The description of the river and of the country has been already given, as far as it belongs to the British territory. Not having had the permission to enter the Siamese territories, I had recourse to native reports, which state that the sea on the opposite side is only between 35 to 45 miles distant. What the nature of the country is I do not know, but I met near the frontier a party of Shans, who were accompanying a Siamese high priest back towards Bankouk; this priest came ostensibly for the purpose of visiting his relations, settled two years since within the British territories, but probably with the intention to report to his Government about the new Siamese villages. It was 7 o'clock in the morning, and his party said that they hoped to be in the evening at their boats on the Siamese side—this was on the 26th of April, consequently just before the monsoon, when the waters are at the lowest. Now, should the coal fields above described be brought into the extensive use it is expected they eventually will be, and a rail or a train way be made from the navigable part of the Tenasserim river to the coal field, a communication will at once be carried on, to almost the highest part dividing the two seas and approaching the Siamese Gulph within thirty or forty miles, at the same time, meeting in the same parallel within perhaps 15 miles, a navigable river, the passage across the Malayan Peninsula, would be completed with ease and expedition for the purpose of communication with China. Objections might indeed be raised on the part of the Siamese Government, but which it is to be hoped would perhaps, just now easier than ever, be overcome. The Siamese at first might be induced to permit a free passage to letters through a post office established in one of the villages near the sea, and allow perhaps even their own people to transport, if necessary, coals overland to the opposite sea coast for steamers, if required, running between Canton and the east coast of the Peninsula, which might eventually lead to the accomplishment of all that could be wished.

Nature of the country and probable distance.

Objections on the part of the Siamese.

Effects of working the coal field.

The establishment of human habitations (more than a thousand labourers being required in the coal fields) would within a short time render the place known and of importance. The distance from any human habitation would in the first instance render victuals dear, but this would lead to the cultivation of the neighbourhood and gradually increase the number of inhabitants.*

Upon the intercourse between the two nations.

The enterprizing Siamese will be easily induced to visit the establishment, and with little trouble it could be made the mart or fair of commerce between the wo nations. They would bring stick-lac, sapan wood, sandal wood, aloes, gamboge, wax, honey, ivory, hides, oil of jessamine, benzoin, varnish, and cassia-buds, and would be glad to get in return muskets, powder, tobacoo, opium, piece goods, cutlery, &c.

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* Within a short distance of the coal fields, there stood formerly a large Siamese town, which appears to have been deserted at the time of Alompra's devastating march towards the Capital of Siam in 1758. All vestiges of human habitations are however obliterated, and the place only indicated by some old fruit trees, and a large meadow in the midst of the deep forest.

If vessels visit Mergui for the purpose of cargoes of coal, they will thus be glad to bring the above articles instead of arriving empty, and in consequence the prices of Europe and Indian goods at Mergui and on the coast, would be much cheaper than they are or can be under present circumstances.

Order in 1688 to obtain possession of Tenasserim.

It is at the present moment a very interesting record in history, that in A. D. 1688, at a time when the first foundations were laid to the creation of the British empire in India, the Honorable the Court of Directors ordered their servants at Madras to endeavour to obtain possession of the Town of Tenasserim from the King of Siam and to fortify it.

VII.

VEGETABLE KINGDOM.

A.—PRODUCTIONS CULTIVATED IN THE SOUTHERN PROVINCES.

Rice.

Notes respecting rice cultivation.

The same observations which I made in my first report about the Province of Amherst respecting cultivation in general, and rice cultivation in particular, are applicable with reference to the southern provinces. The same slovenly cultivation in every respect (which leaves to a bountiful nature to do every thing, and which exerts itself only so far as to give to nature an opportunity to develope her bounty) takes place in Ye, Tavoy, Mergui and Tenasserim. The Burmese are bad cultivators, they are surpassed by all their neighbours, the Hindoos, the Siamese, the Malays and Chinese. Rice is much less produced in the southern parts. The reason is two fold :—

Rice productions much less in the southern provinces.

1st. The country is not so well adapted for it.

2d. The people cultivate more valuable productions not growing in the north, which give them the facility of exchanging them for rice.

The southern parts, destitute of that great rich alluvium land which constitutes the Province of Amherst, will never be equally productive; however, for the present population, or for treble the number, sufficient of good rice ground can be found chiefly at the deltas of the river, the Ye, Hinzai, Tavoy and its tributaries. Pye-khia, Palouk, Palou and Tenasserim rivers, have deposited in the lapse of ages a great quantity of alluvial land, the greatest part of which is waste and covered with forest.

Tavoy produces sufficiently for its own consumption. Mergui gets rice imported from Maulmain. The cultivation of rice however will never give that profit which other tropical cultivation does. Were it not an indispensable food to the people, they would not cultivate it in Mergui. The Ceylonese, or inhabitants of the islands, who cultivate none at all, being on a too low scale of civilization to pursue agricultural labours, obtain it from Mergui through the Chinese, in exchange for their productions.

Pegu, Amherst Province and part of Tavoy, are so excessively productive in rice, that they seem by nature to be intended to be the granarium in the time of scarcity for India. In Amherst, and also in Tavoy, failures of crops are unknown, and a speculator in rice advancing a certain sum of money to the Riots, after having concluded a bargain, can always be sure to get the stipulated quantity.

Pegu and Amherst province the proper rice country.

The low prices in the preceding years, depressed greatly the cultivation; this year however the demand was so great that all grain was bought up, and Tavoy, which had formerly no exportation at all, was for the first time called upon, to supply the rest.

Demand annually increasing.

The great drawback at present is the time lost before ten thousand baskets can be collected, there being no depôts in Maulmain; a great inconvenience consists equally in the slow operations of cleaning the rice from the husk, this altogether being performed by manual labour with hand mills, chiefly by women. Rice mills, after the American principle, used in Louisiana and New Orleans, would be of very great advantage.

Besides the people do not know how to preserve the rice for a length of time, the Chittagong method not being at all practised. The Isle of France is for the present the chief place which is supplied from Maulmain.

The soil and climate of Penang and Singapore are such that they cannot compete with the rice production of the Tenasserim Provinces. Tavoy supplies Junk-ceylon and the adjoining states, which barter tin for rice, the tin being brought from Tavoy by China junks to Calcutta. The petty states of Kedah, Perak, Patani, Ligor and Sangora produced formerly rice for exportation, but since they fell under foreign dominion, they have greatly fallen off, and import from Penang, which imports again from Maulmain, affording an increased stimulus for rice cultivation in Tenasserim. Should there be a more direct communication with China, intelligent Chinese pretend that Tenasserim rice in years of scarcity, which are unfrequent, would be a good exportation to China, if it could be obtained in great quantities, a remark equally applicable to India, and perhaps it would not be impossible to have Government rice grounds, which could be rented out, but where the tenants in years of scarcity would be obliged to furnish Government at a short warning with the requisite quantity,—in years of plenty they should have the liberty to dispose of a part or of the whole ad libitum, and to induce the Riots to cultivate these Government grounds, the tenants should be benefitted by particular privileges or a smaller land tax. In this way an immense quantity of paddy could be always ready for Government consumption. As it is necessary with every beneficial improvement, instead of demonstrating its advantages, to shew them practically, these Government landholders ought to be obliged to adopt the Indian and Chinese system of transplantation, for if a regular system of cultivation could be introduced, the quantity of rice would be raised upon the land far beyond its present rate of productivity.

Tenasserim provinces a granarium for India.

COTTON.

Cotton plantation very much neglected.

The cultivation of cotton is very much neglected in the southern provinces, nothing for sale being produced, the Kareans plant the most for home consumption. At Metamio the American missionaries turned the attention of their flock towards the cultivation of cotton, and the people of Tavoy buy or barter it from the Kareans, each man carrying his load on his back through the mountain passes 40 and 50 miles distance.

Inferior quality of cotton.

The variety of cotton cultivated however is very inferior, compared with the American and African cotton, though through the whole of Ava no better quality is known, and though the bad Ava cotton is even exported by land, many hundreds of miles, on mules and ponies, into the Chinese province of Yunnan. What a field is here open for a speculator to introduce a better quality! The Commissioner, Mr. Blundell's, great exertions in distributing Pernambuco plants throughout the provinces, have unfortunately failed from the moisture being too great for them, and though the rain in Mergui is more uniformly distributed, yet the plants are equally unproductive. It seems to me that annual plants deserve a greater consideration.

Pernambuco cotton a failure.

Manilla and Egyptian cotton recommended.

In my first report I expressed my opinion that Manilla cotton ought to be tried on account of the congeniality of the climate, and I venture to add now that in the southern provinces during the dry season, Egyptian cotton in ground not too rich would do equally well. Since the introduction of English chintzes, it is said that the home manufacture of the chee pudsos (or woollen native cloths) has greatly diminished. Mergui is entirely provided with them from Rangoon.

SUGAR CANE.

Sugar cultivation equally neglected.

This, an important article, as already mentioned, is entirely neglected throughout the provinces, nothing but a little for home consumption being cultivated in gardens. There are three varieties in use, all three, though not of the best, yet pretty good. The cane thrives everywhere most luxuriantly, and has in the bazar a very low price. In travelling inland, it was a general custom with the villagers on entering their groves to give the coolies and animals sugar canes in abundance. The new emigrants from Siam seem to pay greater attention to the sugar cane than the original inhabitants, and on the smaller Tenasserim many acres of land are exclusively cultivated with the cane. The few samples of Otaheite sugar cane, which have been presented to me by the Agri-Horticultural Society of Calcutta, thrive remarkably well.

Siamese beginning to cultivate sugar.

It has been observed that the Chinese are the only people who understand well the sugar cane cultivation, but until they become more numerous in these provinces, sugar will remain neglected, unless some Europeans should undertake the cultivation of it. Any one well acquainted with the manufacture would find here many facilities, which might not be found elsewhere. In the Straits, sugar cultivation is very flourishing. In Province Wellesley 2000 Chinese are exclusively

Inducements to Europeans.

occupied with the sugar plantations and derive abundant profits. The exuberance of productions in the rich new lands in the province, where the forests have been just cleared, would be one of the greatest allurements for its cultivation.

The same observations respecting tobacco, indigo, coffee, pine apples and plantains, started in my first report, will be found applicable to the southern provinces.

Respecting the betel vines, I have got the following information, with reference to Mergui Province, from Mr. Corbin.

BETEL VINES.

Statistical detail of betel vines cultivated in Mergui.

The largest plantations of this vine are at Cutwain and Beik town (both villages equi-distant from Mergui), but there are small ones in all parts of the town and in every village. The vine when young requires a great deal of care and attention, and must be planted in very rich soil, which is still made more so by the introduction of buffaloe manure and the husk of paddy in a rotten state. The young vine must be perfectly secured from the rays of the sun. The season for planting is in March, April and May; if it succeed well, the cultivator may commence gathering the leaves five or six months afterwards, and continue so doing for about fifteen months, when the vine dies off or the leaves become so small as not to be worth the attention of the cultivator.

The leaves from each vine are gathered once a month, to the number of about 50. There are about 42,000 vines, each giving a monthly return of 50 leaves, or 2,100,000 leaves per month. The leaves are sold in bundles, each containing 50, four of which are sold for one anna. The average consumption for one person is fourteen leaves per day.

The duty on the Betel vine is levied annually, every 100 vines paying a tax of rupees two, but for the encouragement of cultivation, a planter, who may have an extensive garden, does not pay a duty on more than 600 vines, beyond which he may grow ad lib. without subjecting himself to a heavier tax on this article than rupees twelve per annum.

The amount of duty collected this year is rupees 840.

GAMBIR.

Gambir occurring wild in the provinces.

The Nauclea Gambir, Calechu or Terra Japonica is occurring in the southern provinces, chiefly along the banks of the Lower Tenasserim, at Tenasserim itself, and below it; whether it is indigenous or introduced at some period, when these parts were more populous, I do not know. It attains the height of six feet, and [illegible] be observed not far from the river banks, and seems, though perfectly wild, to grow very well. The natives, the Karens at least, are acquainted with its properties, and chew the leaves with betel vine together.

Terra Calechu, a different production.

The Terra Calechu of the bazar is not produced from the Gambir. It is chiefly imported from Rangoon, and comes from Ava, and is the product of the Acacia Calechu, which, as in Hindoostan, is very common in Upper Ava. Only a few of these trees grow in the town of Mergui.

This astringent has been lately greatly recommended as a substitute for oak bark and summach leaves in Europe.

ARECA NUTS.

Areca nuts a most valuable article.

Areca nuts form one of the few articles of production of some importance in the southern provinces. The areca in Hindoostan is undoubtedly a stranger, it thrives poorly in Maulmain itself, it is not yet at home, only the rich alluvial islands in the Salween produce the palm, but the quantity of fruit is not great. The latitude of Tavoy or the 14° seems to be the beginning of their home in the eastern hemisphere. In the valley of Taunbiaun you may see the first extensive areca plantations. The palms improve decidedly towards the south; and in Mergui you may see them already in full vigor. They produce there already as much as in the Straits, i. e. a tree in good bearing yields at an average three to six bunches from 90 to 160 nuts each annually; the climate may be therefore pronounced congenial to their growth. There is not one hut which has not an areca garden or at least some trees, and even the Kareans in the south plant them. The plants seem to require no particular ground. Rich mould on the sides of the hills and moist situations, seems to me to be what they require. The great fault of the natives is that they crowd them too much and impede their growth. On the island of Madremecan, opposite the island of Mergui, some fine cultivations sprang up lately, not one however in the whole province of an extent sufficient to merit the exclusive denomination of an areca plantation. The following notice is from Mr. Corbin in Mergui:

Notice about the areca plantation in Mergui Province.

This year's produce of the areca nut was in number 4,200,000, the number of trees bearing fruit 14,000, that of those not bearing (from one to six years growth) 150,000. Each bearing tree pays a tax of eight pies or two-thirds of an anna per year, and the average produce of a tree is 300 nuts, which are gathered in the months of September and October, and sold in the bazar at the retail price of twelve for an anna. The tree generally produces in its seventh year; the first year it is planted, if the soil be suited to it, the plant will grow to the height of 3 feet, but the following years it does not shoot up at the same rate; a growth of 1½ to 2 feet is the most that is expected. The areca will give fruit about twenty-five to thirty years, when passed bearing, the tree is cut down and the wood principally used in the construction of native houses, for floors, rafters for the roof, &c. The fruit when gathered if left in the husk will not keep good above two or three months, therefore it is husked and put in soak for about three days, then exposed to dry, when it becomes of a red colour and preserves in this state for upwards of a year; if it do not undergo this process, it becomes white and the natives do not approve of it, neither does it keep the same length of time. The price of the red is generally double that of the white. Taking the whole of

the population, the consumption of this article may be computed to one nut per day for each person. It is not exported from this, as the quantity collected in the province is not near sufficient for the consumption; the supply is made up by importations from Penang and the Nicobar Islands during the months of February, March and April.

This season 2,905,000 were imported and sold at eighteen rupees per 10,000.

No duty is charged on goods either imported or exported.

COCOANUTS.

The cultivation of cocoanuts has been sadly neglected, though they thrive, especially near the sea coast, admirably well. Cocoanuts neglected.

There are not even sufficient trees to answer the limited demands of the natives, and several ship loads of cocoanuts are annually imported from the Nicobars.

The natives have a great reluctance to plant cocoanuts. They excuse themselves by saying that twelve years must elapse before they can see the fruits of their labor, but there is another reason. In the time of the Burmese all cocoanuts belonged to the chief of the town or village, and by whomsoever planted, they were considered the property of Government, as the Burmese to this day have not yet given up the idea, that the English will either voluntarily give up the provinces to the Burmese or have a good chance to be expelled themselves, they consider the cultivation of cocoanuts a great risk, as in the case of a Burmah rule they are sure to lose such property. Prejudices of the natives.

The cultivation of the cocoanut, where it can be effected, merits particular attention and encouragement, as it is an universally useful tree. It is not only an article of food to every one, even to the commonest labourer, but it is a valuable article of exportation. The natives say that cocoanuts on the Nicobars yield on account of their age annually less, that few new trees spring up, and that in fact they are managed by the natives themselves so badly, that in a short time the supply will not be sufficient. As these provinces draw altogether their supply from the Nicobars, in that case, the price of cocoanuts must very soon rise, and extensive plantations in Loco would therefore be highly advisable, much more so because of late years the cocoanut oil has formed an article of exportation to England, where it found an excellent market, being found of great use in the manufacture of candles. They merit however particular attention. The supply from the Nicobars diminishing. Cocoanut oil for the English market.

Extensive plantations cannot be expected from the present landholders, on account of the great outlay of capital required before it begins to return the interest. The palms begin to bear in the eighth year, and one in the twelfth in full bearing in each tree, as above stated, yielding then from eighty to hundred nuts annually. The cocoanuts have many enemies in other parts, which are here either Slow returns an obstacle.

unknown or insignificant. Amongst these is a species of calandra, which descends in the shoot of the young plant and kills it.

Number of trees in Mergui province.

* The number of bearing trees in the province of Mergui are 2,540, each producing about fifty nuts per year, making a total of 127,000 nuts: these are consumed in their green state by the inhabitants. The number of young trees may be calculated at about 2,000, these commence to bear when nine or ten years old, and continue doing so till they are fifty or sixty. The market price of the green nut is rupees three per hundred, a duty of eight annas per year on each bearing tree is levied by Government. The trees growing within the town and at the village of Catwain, situated about two and a half miles N. E. of Mergui, are considered the most productive.

Nuts for culinary and other purposes are generally imported from Penang and the Nicobars, at the same season as the areca. Imports in 1838, 10,000 cocoanuts at rupees 3-8 per 100.

NIPAH.

(Nypa Fruticans.)

Nipah, one of the most useful palms.

This is a very useful palm which occurs only in great abundance in the southern parts of the provinces. In Maulmain only few straggling specimens are to be met with. In Ye district they begin to be more common, but it is only from the Palon river, they seem to be at home; in Mergui they are to be found in perfection. It is in fact an indigenous plant of the Indian Archipelago, which like many other vegetable productions of that peculiar part of the world, ascending as far as Mergui, without however reaching the latitude of Maulmain. This palm is a production of the brackish water growing exclusively in the Mangrove territory. It is a palm without stem, the lower part of the branches is, at high water, inundated.

Its territory.

Grows quick.

The Nipah grows partly wild, but is also cultivated, and the Mergui people consider it a very productive cultivation. The plant grows quick, so that it is in the fourth year full grown, and requires very little care, nothing but the annual cutting down of the surrounding salt-water jungle being requisite. As however all cultivation is carried on only on a very diminutive scale, it is evident that ample room remains for increased cultivation. The numerous creeks, the numerous arms of the Tenasserim, and the intermediate Nullahs in these marshy localities, are the places, where it could be propagated with advantage.

Double use.

The use of this palm is double.

Leaves.

1st. The leaves are the only thatch of all the roofs of the houses in the provinces, and as they last only three years on account of the attacks of lignipeduous insects, chiefly of the genus bostrichus and rhinosimus, it may be imagined that the consumption is very great. The leaves are exported almost all from Mergui to the northern parts.

* From Mr. Cantlie.

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[illegible]

[illegible] in the [illegible] [illegible] [illegible]

[illegible]

[illegible]

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8—STIMULANTS, FRUITS AND VEGETABLE PRODUCTIONS

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PRECIPITATION

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HUMANKIND

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The vessel [illegible] Master of the [illegible] Port of [illegible] Tonnage, according to Measurement, [illegible] Tons, and [illegible] Tons, and [illegible] Tons, and

DISTINCTIVELY

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CHAPTER III.

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[illegible]

THE BLACK VARNISH.

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[illegible]

[illegible]

[illegible]

C. WOOD-CUT.

[illegible]

[illegible]

[illegible]

[illegible]

3.—FRANKLINENE.

[illegible]

4.—OTTO.

[illegible]

Extent of the forests in Tenasserim.

On the island of Mergui occur the best specimens of these forests in Tenasserim. The accompanying illustration is taken from a strong report on the experimental cultivation of Mergui Province by Dr. Griffith and Captain Cogan—this was having been considered a priori unfavorable by the Indian Authorities. It therein very well, but no great trees, which have been used 12 inches in diameter.

3.—WOOD—A—BAMBOO

Bamboo belongs to this class of the forests, many thousand acres are covered with it. All bamboo grows spontaneously, the Burmese do literally never raise it, the necessary stems is essential either to clumps of land, and to provide them with the cultivation, except occasionally in some to a point thereon, with the primary variety. All alluvialis being alluvial throughout the province, on the cultivation of bamboo in Central parts of Tenasserim has ceased to exist.

Species of bamboo.

The varieties cultivated by the Burmese are very numerous, and most of the native have a peculiar variety of their properties. By the use of the wood, pliability, durability, which is so valuable, is almost all their implements, instruments and houses are fabricated from bamboo. It is certain that the bamboo found in the country includes several Genera, as well as Species, and yet seems difficult to distinguish the botanical characters of the bamboo, many bamboos are only found in the forest where, and which the plant decays, which leaves the stems and roots, and after the rains have ceased, the Bamboo forms, grows. The best bamboo, sometimes 8 inches in diameter, occurs in the interior, on the shores generally the east side of the elevated ridge, on the hills, island in the Indian Archipelago, Tavoy and Tenasserim Mergui Provinces, the bamboo is commonly in solitary, great part of it however is occurring in the hamlets of the adjacent Indian peninsula.

Are bamboos ever in flower.

As the plant is not an inhabitant of bamboo, can hardly be expected, except in the case that they were sown, seeds, to take to clumps of land, and no doubt another more valuable seeds would fill up the remainder of those spaces with bamboo from the rate upon which can be transplanted down the year.

4.—TEAK FORESTS

Teak in Tenasserim.

The teak forests of the Tenasserim Provinces extend to the 16° of latitude, or they are only to be found in the eastern Provinces of the Attaran River and the Gulf of Martaban. [illegible] Tenasserim, where Amherst, the Tavoy River [illegible] of the Attaran, not to a great extent, but to the south, north, east, in the Provinces of Tavoy and Mergui. In Provinces Amherst, where it occurs, [illegible] the [illegible] [illegible] [illegible]

of the last. The teak forests existing on the Attaran, are the most extensive within the British boundaries, and the timber which they produce is considered superior to that which is cut on the Salween and Thoungyeen rivers. The same system which is used in the two first districts is equally followed in the last. The forests are let out by Government to private individuals, and a tax of one rupee levied upon each tree brought to Maulmain. This unrestrained liberty accorded to any individual to appropriate to himself, any unoccupied forest under such liberal conditions, unattended without doubt in the first instance, very much to render Maulmain a prosperous place, but it cannot be denied that a continuation of the same system will lead in a short time to the extermination of all available teak forests, and deprive Maulmain of this valuable resource, and render Calcutta once more dependant upon foreign importations for teak timber. It cannot be expected that individuals whose only care it is to render themselves independant in as short a time as possible, should care about the preservation of the forest, and experience has taught, that by far more trees are destroyed than used. A particular survey of the teak forest, well drawn lines of demarkation, an improved system of regulations, the appointment of a responsible European to enforce the observance of these regulations, and new plantations laid out in all the places where teak formerly grew, and where this now almost extirpated, are measures necessary to be introduced to secure an uninterrupted supply of teak timber for the future. Mr. Blundell, the Commissioner of the provinces, having particularly addressed the Government upon the subject of adopting these or similar measures, I refrain from entering into further particulars.

Teak forests on the Attaran.

Depredations regulations.

Necessity of a new system.

C.—TIMBER IN GENERAL.

The Tenasserim provinces are an almost uninterrupted immense forest from the water's edge to the summit of the mountain ridge, 6,000 feet in height; all ground left to nature, is without discrimination, with at exception, covered with timber. There are no marshes, no sandy plains, no lake rocks, no such thing as an Aspatia, no Saccanda, nothing resembling a New Holland pastorage, only the pigque in endeavours of man securing the soil for his own purposes with the assistance of fire, have directed a small fraction of the area from the primitive forest.

The Tenasserim provinces are an almost uninterrupted forest.

The area being 30,000 square miles, it may be assumed that one-fifteenth part of it is cultivated, leaving one other fifteenth for rivers and two other fifteenths for country which has been burnt down, and where only local vegetation has taken possession of the ground. Once assuming yet 22,000 square miles occupied by forests. Supposing that trees (mentioning at least trees in size in diameter) stand thirty feet apart from each other on an average in a forest, then each tree occupies 900 square feet or 100 square yards.

Calculation of the number of trees.

4,840 yards=one acre.
640 acres=one mile.
100,000,000 yards in one mile.

29,040 trees in one square mile, multiplied by 22,000 miles, there are 638,880,000 timber trees in the provinces.

Their value—great capital in my dominions.

Each tree counted on an average at two ranks intrinsic value on the spot, there is at present a dead capital of 79,800,000 rupees in the timber alone, which wants to be called forth into activity to prove useful.

Though one-half of it is so situated that centuries will elapse before it will be turned to any use, yet the other half is so placed that it is available. The whole of the country on an average not more than fifty miles broad has a sea-coast accessible to all parts of its degrees or 414 miles in length; the land is intersected in all directions by numerous rivers, the tide ascends in some parts 120 miles up the country, the timber of the islands is close to the edge of the sea—and with all these facilities the timber is hitherto entirely neglected. I have now already gathered a catalogue of 377 different species of trees, each of which attains at least a diameter of 7 inches, and amongst these are species fit for every imaginable purpose.

Division of all the timber trees.

The trees in general can be divided in—

1st. Precious trees—that is, such where the wood is sold according to weight, such as sandal wood, camphor wood, the fine grained ebony, the iron wood wood by the Chinese instead of nails, the sapan wood, and other woods yielding dyes.

2d. Woods fit for objects of ornaments—such as the chessmen tree excellent for turnery, fit for furniture such as the mahogany of the provinces.

3d. Timber for ship building—besides the teak, such as the anam, the asjin, the kasanthi, the pynmah, and twenty others, some of which are by the natives preferred to teak, such as the thingan (hopea odorata) for that part of the vessel which remains under water.

4th. Such as are fit for military store house building and utensils—of which there is a great variety. The number of heavy woods not floating in the water is comparatively very great.

5th. Such as yield spars for vessels.

6th. Such as are peculiarly fitted for planks.

7th. Such as yield good charcoal.

8th. Fire wood.

Peculiarities in growth and strength of the forest trees.

The greatest number of trees have the peculiarity to rise straight up, to elevate their branches above the lower vegetation of the forest, many having a bare trunk of from 40 to 100 feet in height, without one single branch, and these form generally a small crown compared with the size of the tree. Another peculiarity of these majestic productions is, that the circumference of the tree is not in the same proportion to the height as we are accustomed to see in Europe, that is, the height is in perfection for greater than the circumference—which is to be

considered as an advantage, as in most cases the length of the tree is of greater value than the thickness.

The firmness and elasticity of the greatest part of the woods is another characteristic, and this again is the natural consequence of their great height. If nature had not given them this property, they could not stand the impetuosity of the storm, but would have been broken down in numbers. This is however very seldom to be seen, and in no way proportionate to the damages, which forests chiefly of fir and pine, suffer in Europe.

A collection of specimens of timber trees, in number 180, gathered alone in the Province of Mergui, will be soon delivered in Calcutta.

VIII.

ANIMAL PRODUCTIONS.

1.—ELEPHANTS.

Elephants very numerous.

The number of these animals is here greater than in any other part of India, Ceylon not excepted. They enjoy the uninterrupted possession of the uninhabited wilds to the eastward, and have an ample sphere for their migratory habits, from the Chinese seas, through Cochin-china, Tonquin, and Siam, to the Tenasserim Provinces. The absence of population and the superabundance of to them congenial vegetable productions, attracts and maintains these great numbers.

Herds of the Asiatic elephants.

The Asiatic elephant shuns the neighbourhood of man more than any other animal. The depredations upon plantations which the elephants perpetrate in Africa are here unknown. The nature of the African elephant must be different, for sugar cane and plantain trees are equally delicious morsels to the Asiatic species. In these provinces it is known that the elephants instantly retire when some village, or it may be even only the frail hut of the jungle Karens, is built in the forest. In the plains of Amherst Province the elephants are scarcer, but become more numerous towards the eastern boundary and near to the high mountain ranges. To the south of Maulmain on the Upper Attaran, they are met frequently during the monsoon. Herds of thirty and forty pass through the mountain ranges near the Three Pagodas. To the eastward of Ye, chiefly towards the Zhay town, they are met in numbers. Near Tavoy they are almost never seen, in consequence of the comparatively dense population. Near Belen they are temporary guests during the monsoon. They are rare on the Upper Tenasserim, and scarcely ever seen near Mergui, but they are in the greatest number to the south of Mergui and east of Tenasserim. Visiting that unknown tract of country, where recently the real fields have been discovered, along the banks of the Little Tenasserim, they were so common, that on the banks of that river, scarcely a place of a hundred yards length, would be found which did not present the impressions of their recent passage.

Food of the elephants.

The food of the elephants is different, and diversified, from the tender grass to some hard species of wood in the forests, but their chief food are the leaves of the bamboo, several species of ligneous creepers. They relish chiefly all plants which contain the milky juice from which caoutchouc is formed, and all trees either belonging or nearly allied to the genus ficus, hence their predilection for the branches of the pipal tree.

The elephants like the rhinoceros, buffalos and hog, are fond of water and mud, the monsoon therefore is their favorite time; then they descend into the plains and approach closer than ever human habitations; after the monsoon they gradually retire into that great mountainous tract denominated the central territory by the Burmese, where they wander undisturbed, for the elephants with the greatest part of their life, and it is pretended, that a healthy elephant never lies down, except to cool himself in water, and that he, properly speaking, never sleeps. Habits of the elephant.

The Burmese do not turn to any account this useful animal.—In fact the occupations of elephant trainers, drivers, catchers, shooters and hunters, are entirely in the hands of the Siamese, who are considered very skilful with them; though wild elephants abound in the Tenasserim provinces, the number of tame ones is very limited, and now only used by the tenants of the teak forests for dragging wood, and these elephants are almost all imported to Maulmain from the Shan States to the north of the British possessions. In the southern parts of the provinces tamed elephants are unknown or a great curiosity. Burmese do not use much elephants.

The price of a first rate grown up male elephant in Maulmain is 350 to 380 rupees. The price was formerly lower, but the increase of the timber trade increased the value of the elephants. Price.

The trade with ivory is equally in the hands of the Shans or Siamese, and chiefly in the hands of those who are foreigners. They come even so far as from Zimmay to Tavoy, wandering for months in the wilds, shooting elephants, but few sell their ivory in the Tenasserim provinces, but return with it to their country because they know to be themselves intruders who despoil the produce of a part of the riches and revenue. Some attention should be paid to the subject, more, now, when the throng of Siamese emigration in the southern parts of the provinces increases annually, and they themselves begin to turn their attention to the trade with ivory. They themselves have already claimed redress against the intruders, who, not content with shooting elephants only, depredate also their little plantations. Trade with ivory.

These elephant hunters are a very hardy race, able to support every change of climate and country. They live for months entirely upon the fruits of the jungle and upon dried meat of the elephant and wild boar; their arms are common English muskets, they fabricate their own powder, and shoot with bullets made of lead and tin, sometimes mixed with copper. Manners of the elephant hunters.

These people know the country the best, and are perfectly well acquainted with every pass leading into Siam. They bury in certain marked places the ivory, returnlee into Siam, they dig it out and carry it to the next river on the eastern side of the Pahanzeia, and completes the rest of their lonely pilgrimage by water.

The chief mart for the fruits of their expeditions is Bankook.

Besides the tusks they never fail to cut off the tail of the elephant, which is considered by the natives of higher rank a becoming ornament. All the rest of the huge carcase (excepting sometimes the claws) is left unused to decay.

The Tenasserim elephants considered inferior, and reasons.

The elephants of this country are noble and large animals, they are however considered much inferior in strength to the Indian. The reason of this inferiority is not to be attributed to the race, but to the manner in which they are kept and fed. Every elephant is supposed sufficiently able to gather his own food in the jungle and is scarcely ever fed with rice cakes. As the elephants in the teak forests work sometimes hard the whole day, and are expected to feed during the night in the jungle, they have indeed very little time for rest, and cannot be expected to endure the fatigues any length of time.

The Indian army could be supplied with elephants from this coast.

Propositions to establish an elephant

Government could easily supply from here at a moderate cost all elephants requisite for the Military service in India. It would be perhaps recommendable not only to catch and to tame elephants, but also to institute an elephant stud. It is not yet sufficiently ascertained that elephants do not breed in a nominal captivity. It has not yet been properly tried. I consent that elephants will not propagate their species in a narrow space or stable, but if kept in an enclosed extensive jungle forest during the time of their excitement, it would perhaps be otherwise, at least the experiment would be worth trying. In any other part of India, excepting Ceylon, it would be difficult or impracticable; the vegetation and the quantity of congenial food to them is every where scarcer than here, besides the extent of country at the disposal of Government is here greater than anywhere, a large tract of convenient country could easily be selected, and as easily roughly enclosed, wood being no matter of consideration. For the present it would of course be cheaper to catch and to tame the wild animals, and it is only a proposition to provide for the future, for the more the advance of civilization claims the soil as its own, the more must its primitive inhabitants retire, and just the elephant claims the widest range for his exploits and for his unparalleled peregrinations.

2.—RHINOCEROS.

Three species of rhinoceros.

Of this genus the single and double horned species occur in the provinces, and it is still doubtful if there is not yet the third known to naturalists under the name of Rhinoceros Asiaticus Sumatrensis, likewise as it is not yet ascertained, if the tapir of Sumatra is to be found in the southern parts or not.

The single horned species is in many parts very common, the double horned perhaps not more scarce, but more wild, hidden in the recesses of the forests, and shot only sometimes by surprise.

Karens the proper rhinoceros hunters.

It is very seldom that these animals approach villages, but they are met close to the solitary abodes of the sylvan Karens. With these it is a passion to hunt rhinoceros, in which they are very skilful, knowing as they say the best places to hit the animal, pretending that no Burmah knows the secret to run a ball through the body of the rhinoceros.

The fact is that the Burmese in general are bad shots and cowards, and many do not dare to approach the rhinoceros, fearing its furious attack when wounded. The Shans, undoubtedly the best and hardiest huntsman, feel only a passion for the elephant—so all rhinoceros fall to the share of the Kareans.

It is an interesting observation that the rhinoceros like to drink mineral waters. The warm hydro-sulphurous springs are very common in the provinces, and when found in the recesses of the forest, I observed always the marks of rhinoceros in the surrounding mud. The Kareans profit of this circumstance, building small huts in the trees above the water, expecting the arrival of the animals, to shoot them from there in safety.

Rhinoceros fond of mineral waters.

The number annually killed, but only guessing roughly, is about
from 60—100 of the one horned,
„ 20— 40 „ „ doubled horned species,

Number of rhinoceros killed annually.

but these are only males. The rhinoceros when got at is generally in a wild gloomy den, and the huntsman is very often unable to distinguish the sex. Finding the shot animal to be a female, after cutting a small slice of meat from its haunches to satisfy his momentary wants, he leaves the carcase, taking however the trouble to extract the claws which are considered talismans.

There is a trade carried on with the horns, which is entirely monopolized by the Chinese and destined solely for the Chinese market, where the horns are esteemed a valuable medicine, used either transformed into drinking vessels, and supposed to contain the virtue of discovering poison, or the horn is filed into powder and taken internally on extraordinary occasions.

Trade with the horns.

But like every thing with the Chinese has some mystery known only to themselves, so it is also with the horns. To excuse the inefficacy of the pretended invaluable arcanum, which in fact must manifest itself too often, they assume to know certain signs of exalted innate virtue, which if found, increases the price very much, and for this reason it is difficult to know the pretended or real value of the article.

Superstition and fraud with the horns.

The greatest number of rhinoceros is shot in the southern parts of the provinces, and one Chinese is settled in the old village of Tenasserim, chiefly for the purpose to buy up first hand all horns which can be procured.

The poor ignorant Kareans are always the dupes, they do not know the value, and barter it for trifles. The Kareans have sold small horns at three rupees per piece.

In China the same sell from thirty to fifty rupees, the trade could be carried on on a larger scale if the hundreds of islands of the Mergui Archipelago would be visited, many of which have never been penetrated by men—they swarm, it is said, with rhinoceros.

Hides not used.

It is a great pity that no notice has been taken of all the hides which have been permitted to decay, by which negligence the firmest and strongest leather in existence is lost and wasted.

Rhinoceros a domestic animal.

It is generally acknowledged that the full grown rhinoceros is one of the wildest animals, yet it is known, that young ones have been perfectly domesticated; it has even been proposed to employ them for carrying burthens like buffaloes and tame them for agricultural purposes.

3.—HIDES IN GENERAL.

Trade with the hides entirely neglected.

The trade with hides, so very common in countries which are just emerging from a state of rudeness, where men have occupied but a small space, and animals are the undisturbed masters of the country, is entirely unknown on this coast, though there is a variety of skins, hides and even furs, which are allowed to run waste.

The carcases of elephants are allowed to decay without taking off their skin. It is known that the savage tribes in Africa seldom allow this to happen, and among the Ashanteos the armour of their warriors is partly made from elephant skin, and the elephant tails are emblems of royalty.

The skin of the rhinoceros is still more valuable, being when dry so strong and elastic that no musket ball can penetrate—it is supposed that some of the invaluable shields of the heroes of antiquity were covered with the hides either of the hipopatamus or rhinoceros; there are hundreds annually shot, yet nobody ever thought to divest the carcase of the skin.

Buffaloe hides.

The same carelessness takes place with the hides of the buffaloes. The buffaloes are the only cattle of the Burmese, and they are chiefly in those parts where rice cultivation flourishes numerously.

The Burmese use only the buffaloe to prepare the rice ground, and to tread the paddy out; they neither eat the meat, nor use the milk, nor sell the hides. Towards the end of 1836, unfortunately a great epidemic affected the buffaloes of the whole province, and it carried away it is supposed 20,000 buffaloes, one-third of the whole number in existence. Not one single skin of this great number came in commerce, even the horns were allowed to lay scattered about, though the trade of buffaloe horns in India is not inconsiderable. But so much are all resources in these provinces unknown and unused, that only since two years some Mogul merchants in Maulmain, began to collect buffaloe horns, which are to be got at a very low price.

Deer skins

A trade with deer skins does not exist at all, in Siam on the contrary a considerable trade in that article is carried on with the Americans and Chinese. The number and variety of deer is great, but they are seldom shot by the natives, who prefer the wild hog as a venison, and they remain a quiet prey to the numerous tigers.

The skins of the tiger, panther, leopard and cheater are equally unused and their value entirely unknown. I had opportunity to buy good tiger skins at eight annas per piece. In Maulmain where people get a remuneration for killing a tiger from Government, they throw, after having brought some part of the animal, the tiger itself in the river, without farther notice, or leave it in the jungle. Tiger skins.

The large black squirrel abounds in the forests, and is I am told an acceptable fur to the Chinese, yet it may be easily imagined, that it is still less known to be of any use. Squirrel skins.

It is here the place to mention a petty trade which is carried on with the skins of one species of bird of the genus halcyon or king-fisher, part of whose feathers are of a beautiful sky blue colour, and which are eagerly bought up in China, where they are used for Mandarin state dresses. The people chiefly on the Upper Attaran are occupied with the chase. They tame one of these birds, and place it upon a trap in which the bait consists of a fish. The wild bird rushes with impetuosity into the trap to seize the fish before his supposed antagonist has time to get at it. Birds' skins for Mandarin dresses.

The people dry the skins in the sun, and sell them in bundles of ten. I am told the price they get is four annas per piece.

I am very little acquainted with the productions of the sea, having had no opportunity to visit much the coast or any of the islands. The productions of the islands however are precious; those from which Government derive any revenue are the following: fisheries in general, gnapoe, or a paste prepared from small shrimps, a common and indispensable article of food among the natives, tortoise shells, birds-nests, sea slugs. There are besides corals and pearls and pieces of amber to be found, but little about this is known. Productions of the sea.

It is necessary to observe that the productions of the southernmost parts of the provinces, chiefly those of the Mergui Archipelago, are almost entirely in the hands of the Chinese and some few Malays. In the hands of the Chinese.

The scanty intercourse with the islands, sometimes none at all, places the people there at the mercy of every one, who will profit of it to impose upon these poor migrating fishermen, who inhabit them, and the headmen, as well as the Chinese traders, are able to do it with secrecy and impunity. It is generally said to be the case, that they intoxicate these poor wretches at first with opium and arrack, and spoil them afterwards deliberately of the valuable productions of the sea which they have contrived to collect. Great abuses.

Endeavours to induce these people to come to Mergui, to [illegible] of their taxation in kind to the place, to have it sold before their eyes by public auction, and to get the surplus faithfully back, have proved hitherto unprevailing; like the Kareans of the interior, they are afraid to visit the towns, though they ought now already to know, that their persons are safe, and that nothing but justice

will be done to them. The sad experiences which they had opportunity to witness in the time of the oppressive and arbitrary disposition of the Burmese rule are not yet forgotten, and these poor tribes know nothing about the new Government, except that they have less taxes to pay, even which fact some of their wise men explain to be a snare to entice them.

WAX—HONEY.

There are several kinds of bees working wax and honey, all of whom are different from the European species.

Different kinds of

One very large kind builds a nest or combs on the lower part of the branches of teak trees in the form of a protracted pouch or bag. Several families or swarms occupy the same tree, and one large tree on the Tenasserim was loaded with forty-three distinct nests.

Different kinds of honey

This is the jungle or tree honey which is got in a liquid form of syrup consistency, of a yellowish transparent colour. It is a favourite dish of the Karenns, who are very skilful to smoke the bees out at night time.

Another kind of bee builds its nests only on limestone rocks, and selects generally a perpendicular wand. There is an isolated limestone rock on the Tenasserim, which is occupied by numerous swarms, and the approach to it in the day time is considered very dangerous. Another rock to the south of the village of Tenasserim is considered Government property, and the getting of honey and wax there is rented out. The honey of this kind is more liquid than the first, of a reddish brown colour, more sweet and aromatic than the first. The very superior hard honey of Ava, which properly speaking comes from the Chinese frontiers of Yunan, is in the country unknown.

Varnish formed by bees.

Another kind of bees forms its nest, instead of wax, of a substance which belongs to the resinous gums, and yields that valuable substance which has been considered a vegetable production, and which since late years has been imported to Europe under the name of dammer from Sumatra.

It yields a varnish which has been used for coating paintings, and has been considered valuable and superior to copal.

Pitch, a production of bees.

The common pitch used in Maulmain for ordinary purposes is also an animal production, and is equally part of the nest of a bee which inhabits hollow trees. This species inhabits chiefly the neighbourhood of the teak forests, and the substance is brought from the Upper Attaran.

Upon examination I found that with proper treatment it yields a substance very similar to the Venetian or Bordeaux turpentine. This production must be distinguished from another kind of pitch which sometimes is to be got in the bazar of Maulmain, and which is the resin of a pine tree growing in the high tablelands between Amherst Province and the Burmese territory, Shan State of Labong.

BIRD'S-NESTS.

The bird's-nest islands (more properly rocks), subject to this province, have generally been sold at auction for a term of years. Bird's nests of Mergui province.

The last three years they have been engaged by an old Malay; they were sold to him at Rupees 2,000 a year. The time for collecting the nests is from January to April; the average quantity collected may be reckoned at from fifty to sixty viss annually.

They are of three qualities:

The first	selling	at from	100	to	120	Rs.	per	viss.
„ second	„	„	„	70	to	90	„	„ „
„ third	„	„	„	50	to	60	„	„ „

The bird's-nests are seldom if ever sold at Mergui, they are generally taken to Penang by the renter, where he finds a much better market for them.

SEA SLUGS, BICHE-DE-MAR, 1837.

Statistical notices from Mr. Corbin.

Of these there are three qualities brought into the market, the long black, the round black, and the white; the first is considered by far the best and is sold at a very high price. In 1837 the undermentioned quantities were sold in this market:

362	viss of long black	at Rs.	150	pr. 100 viss,	Rs.	543,	duty 10 pr. ct.	Rs.	54	7
2770	„ round	„	„	35	„	„	„	969	„	„	„	„	96	14
3600	„ white	„	„	15	„	„	„	540	„	„	„	„	54	0
6732								2052					205	5

The sea slugs are collected and cured on the islands of the Mergui Archipelago during the N. E. monsoon, chiefly by the Salonese (or inhabitants of the islands), but the Chinese and Malays also collect, cure, and bring them in for sale.

TORTOISE SHELL.

During the N. E. monsoon of 1837, thirty-three viss of this article were brought in this market for sale by the abovementioned people, at the average price of Rs. 20 per viss; 33 viss at Rs. 20 per viss, Rs. 660—duty 10 per cent, Rs. 66.

FISHERIES.

The duty on fishing stakes is collected monthly, each stake being taxed at a certain rate according to its size.

In 1837, the duty collected amounted to Rupees 2,097.

GNAPEE.

The fish with which this article is made is caught in large split bamboo baskets, made for the purpose, and moored in the stream, running in and out of the different rivers; the fish is taken out of the baskets at the change of each tide. It is settled that each person pay to Government a certain sum for the season, in proportion to the number of these baskets which he may be working.

In 1837 the amount of revenue in Gnapee paid into the treasury, was Rupees 2,339; in 1838 Rupees 2,242.

The daily consumption of fresh fish in the town of Mergui may be calculated at about one viss to every twelve persons.

J. W. HELFER.

Mergui, 23d July, 1838.

F I N I S.

G. H. Huttmann, Bengal Military Orphan Press, Calcutta.

FOURTH REPORT

ON THE

Tenasserim Provinces,

CONSIDERED AS A RESORT FOR EUROPEANS.

BY

JOHN WILLIAM HELFER, M. D.

REPORT.

ENGLAND has nearly acquired that full amount of improvement and civilization which its situation, as respects foreign countries in Europe, which its climate, its soil, will ever allow it to acquire.

Scotland and Ireland are still capable of great improvement; however, in the former climate renders success precarious; in the other, moral reasons obstruct amelioration.

England would scarcely advance, when confined to England; nay, it would be obliged to retrograde. That which renders England powerful, and continues to increase its riches and prosperity, is its universal commerce, and its transatlantic colonization.

England, of all countries, knew at all times the best to appreciate the value of colonies. All its colonies advance rapidly, and new ones continue to be established. The East Indies, finally, have also been opened to the mass of the British nation, and these immense territories afford a field of such importance, that its vast consequences cannot yet be appreciated at the present day.

Adventurers are always attracted by the hopes of sudden gain, and the fables of India's immense riches, are yet vivid in the imagination of the multitude. As the Spaniards flocking to America in search of the Eldorado, when disappointed turned agriculturists; so when the East Indian adventurers find out the errors of their hopes and fancies, they will become sober colonists; for prospects there are certainly open to them, not to become suddenly rich, but gradually wealthy.

It has frequently been stated that Europeans are not fit to become tropical colonists. If this were the case, no colony would have been established in the West Indies, much less would any have become flourishing. Certainly they are not able to bear the climate as day labourers, at least not the greater part, however they can become landed proprietors, superintending their farms, and carrying on cultivation by the labour of other people.

There is much difference between tropical colonies and colonies in the temperate zone; both sets have their particular advantages and disadvantages. Tropical colonies can only be established by men who are wealthy, or who possess moderate capital to begin with. They employ either the natives of the country in which they settle, or they import foreign labourers.

As the stream of European enterprise will turn towards India, it is necessary to direct it into the most safe channel, and the following paragraphs are written for the purpose of pointing out the different very great advantages which the provinces

of Tenasserim possess, containing all that is requisite to transform them into an European tropical colony able to prosper in an eminent degree.

In every colony the new comer finds the country either a waste or occupied; and if occupied, it is occupied either by temporary tenants, or a fixed population.

Temporary tenants do not make use of the ground permanently; they are tribes of hunstmen, or graziers, or people who resort to certain places for the sake of a particular spontaneous production fit for their own use, or for exchange.

A fixed population makes use of the ground as the source of their livelihood.

The Tenasserim Provinces contain all these divisions combined. A great, and the greatest portion is a waste; part of it is used on account of its teak forests, or sapan-wood jungles, or wood-oil trees; other parts are resorted to exclusively on account of a productive fishery; others, on account of the rocks producing edible birds' nests; the smallest part of it is occupied by permanent dwellers, engaged in cultivating the ground.

I. The first great advantage which the Tenasserim Provinces offers, *is the abundance of lands of every description.*

An obstacle which has been found in most of such uncivilized countries is, that the inhabitants come very soon into collision with the new comers.

This can happen only in countries like America, where the population subsisted upon the produce of the chase.

In Tenasserim this would not be the case, for no part of the population is employed exclusively with hunting, except a few Siamese, who pursue the elephant and rhinoceros, for the sake of the tusk, and rhinoceros' horns. The new comers therefore could only come in collision with the permanent dweller, that is, the planter.

Four-fifths of the native planters confine themselves to the production of rice, which is their chief alimentary subsistence.

The new comer would scarcely begin with this mode of cultivation, but would turn his attention to other articles which are more valuable, and procure his rice from the natives.

The existence of this population of husbandmen is an advantage to emigrants, because they furnish them with food; and it is an advantage to the natives, who find an increased consumption in the emigrant. Another obstacle occurring in countries already occupied, is the spirit of envy and enmity with which the native population is inspired towards the new comers. This spirit of enmity is to be derived either from the principle of self-preservation, or it is founded on religious prejudice and national aversion.

If we judge from experience and inference, nothing is to be apprehended from the natives of these provinces in this respect.

The Chinese wherever they settled in the provinces, though they over-reached the Burmese in every respect, in a short time were always welcomed and encouraged by them.

They have no more dislike or aversion to European settlers than to the Chinese. Their religion is eminently tolerant; and as for national prejudices, they are far from disliking the Europeans, whom they consider rather to be a variety of the human species of a higher order.

II. The first aim of a colony is to give sustenance to an increasing number of people; as culture and produce increase, a surplus is gained, and the next step will be the endeavour to exchange the surplus for other commodities.

The Tenasserim Provinces are eminently well situated for commerce; their extent of sea-coast amounts to 600 miles; the formation of the country is that of a narrow strip of inland, from which descend numerous navigable rivers, keeping it connected with the sea coast, and presenting *the greatest facilities for communication.*

III. The next advantage which these countries possess over all parts of India Proper—an advantage of the greatest importance to European settlers—is *the great salubrity of the climate,* which is so remarkable, that the provinces are considered by persons who have had opportunities of comparing the different climates of America, to belong to the most healthy for the European constitution of all known tropical countries. To be convinced of this truth, it is only necessary to compare the bills of mortality kept by the medical gentlemen of the European British corps, stationed at Maulmain and its dependencies, which prove that the rate of mortality scarcely ever exceeds, and is sometimes less than it would be under similar circumstances in Europe.

To account satisfactorily for this phenomenon is very difficult, when we see the countries almost bordering upon the provinces are counted amongst the most fatal of India; Arracan in particular, where the general appearance and form of the country, as well as the nature of its productions, are said to be similar to Tenasserim.

No other reason can be found, than that the country is either part of a narrow peninsula, or immediately adjacent; and that the extensive seas on both sides produce a constant, though not always perceptible current of air, and consequent ventilation, by which the rising obnoxious vapours of fermenting vegetable matter, and other elements of malaria, are either destroyed or carried away.

It is certain that the Arracan fevers are scarcely known; that liver complaints are of rarer occurrence; and pneumonic diseases scarcely known. It may be even asserted that Europeans of temperate habits, chiefly those not addicted to

strong liquors, enjoy a greater health than natives; especially native children suffering from the small pox, which occurs epidemically at intervals, and carries away at times considerable numbers, much more, because all the endeavours of medical gentlemen to introduce vaccination have hitherto proved fruitless, some isolated cases excepted.

Preservation of health, besides, does not require here those particular precautions so necessary in India.

Bad effects from exposure are of very rare occurrence, as sporting gentlemen have ample leisure to experience, and this would certainly be of immense advantage to a planter, whose chief occupations are in the fields.

The coolness of the nights almost throughout the year, much contributes to restore vigour and health to a constitution which by constant perspiration during the heat of the day in the dry season, is partially exhausted.

The dangers from wild animals, snakes, and other venomous reptiles, are generally much exaggerated in Europe, if not altogether fabulous. In Tenasserim very little is to be apprehended from these animals.

There are tigers, and pretty numerous too, in the country, but they are of quite a different nature from those in Bengal, and probably more afraid of men than men of them. Accidents very seldom happen to natives, who penetrate daily into untrodden jungles, sometimes quite alone. No other quadruped else is to be feared; a planter may reside his whole life-time in the country without even having an opportunity of seeing a wild elephant or a rhinoceros. Dangerous snakes are very rarely met with, and I dare say less fatal accidents happen here than in the south of Europe.

IV. *The fertility* of a country is of a double nature—essential and accidental. The essential fertility is dependent upon the nature of the soil; the accidental, on the quantity of fertilizing matter found upon the surface, constituting a mould of humus. To determine properly the fertility of the Tenasserim provinces, we must retrace our steps to geological principles, and examine the different formations. A great portion of the surface in the interior is composed of primitive rocks, chiefly granite; great parts of the mountains, running parallel from north to south through the peninsula are granite or gneiss. The ridges are divided by valleys of an inconsiderable depth. The mountains themselves are scarcely ever very abruptly precipitous, generally rounded near the tops, without being lacerated. Almost every where, at least to some inches in depth, the surface is decomposed, and throughout covered with lofty vegetation; a bare rock is one of the greatest rarities on the main land. The felspar decomposes exceedingly quick in tropical humid countries, and is found, contrary to the theory of celebrated chemists, one of the most fertilising substances within the tropics; the reason is probably that the caustic of potassa or soda, which forms part of the elements of felspar, is neutralized by the abundance of humic acid produced by the immense quantity of decaying vegetable matter.

Hence we see that the valleys between the granitic ridges of the country into which all the decomposed particles are uninterruptedly swept from the sides of the mountains, together with the numerous decayed vegetable substances, belong to the richest soils of this country. Just this part of the country, chiefly inland, is uninhabited, or only employed by isolated Kareans. Not an inconsiderable portion of the surface of the provinces belong to the transition formations. They are much more abundant in the northern and middle, than in the southern parts. These are to be divided into the schistous and calcareous surfaces.

A great part of the country to the south of Maulmain and to the south of Ye, towards Tavoy, present argillaceous transition schist. This is that part of the country which is the most sterile of all; a more stunted vegetation is immediately observed, and great part of this tract instead of presenting lofty forests, is covered with bamboo. The chief reason of this sterility may be accounted for, by the deficient and but slow decomposition of the schists, and by the absence of sandy particles, and by the great absorption of water and moisture.

The province of Amherst possesses remarkable isolated rocks, or ridges of some extent, composed of mountain limestone.

The plains at the base of these abrupt mountains are remarkably fertile.

The mountains themselves, however, rising sometimes perpendicularly, full of chasms, without any level ground, will be found in every respect unavailable for cultivation.

Secondary formations, and amongst those the secondary sandstones (Gres bigarre) with puddingstones, cover the surface. They are mostly to be found in the southern parts of province Amherst and in Ye province.

These tracts of land will be found but indifferently fertile, and the reason is their aridity, the water being absorbed with avidity by the porous puddingstones; meanwhile the argillaceous parts which enter into the composition form a hard crust, impenetrable to water. Though numerous, these districts never cover a great surface!

Part of the plains of the provinces belong to the tertiary formation; such are the higher parts of Amherst and Ye province, the plains of Tavoy and Kallee-oung, the plains between Tavoy and Polon, such the valley of Taun-biauk and the elevated land of Meta-mio, such the plain country on the Tenasserim river above the site of the old town, which is an argillaceous marly deposit of great extent. All these enumerated places are fertile, scarcely any are exclusively sandy, none, as much as I am aware of, gypsous.

To the postdiluvian formations belong the deltas of the rivers, which are, when above the influence of the salt water, highly fertile; if however so low as to be exposed to the influence of the salt water, entirely unproductive. To the first belong the low lands on the confluence of the Salween, the Gain, and the Attaran

rivers, the small delta of the Ye river, and others of minor note between Tavoy and Mergui; to the latter belong all the mangrove districts, which are entirely unfit for cultivation. The great source of fertility in the country, independent of the fertilizing elements of the ground, is the quantity of the humus, or decayed vegetable matter, which has accumulated through tens of centuries. It is only necessary to represent that the whole country is an uninterrupted forest, the greatest part never cut. This constitutes the productiveness of virgin soils. We can safely pronounce that the greater part of the 30,000 square miles of which the provinces are composed, are fertile, or fit to be made fertile; and that only the higher parts of the mountains and the mangrove territories are sterile; the quantity of unproductive sterile, or unavailable lands, is scarcely one-fourth of the area.

Which part of the province may be the most fertile, is as yet undecided, as so little land is cleared. The northern parts will have the preference as rice countries, on account of the great plains; as the southern parts will be found preferable for perennial cultivation, on account of their approaching more in climate to the equatorial regions. The complaints of natural barrenness of soil, and inaptitude for cultivation said to exist in the Malay archipelago, and so much complained of by Marsden with reference to a great portion of Sumatra, is not applicable to Tenasserim.

V. *The great choice of lands* to be had, forms another great advantage in a beginning colony.

There are as yet no conditions laid down by government under which lands are given to private individuals, probably on account of no body having yet asked for land. Probably the same, or similar regulations will be fixed upon, which exist at present in the Straits of Malacca.

It should then be remembered, that the cultivation will probably take a different turn from that in India, viz. that very few annual, but mostly perennial plantations will be reared, such as of spices, coffee, betel-nuts, &c. and that short leases would be detrimental to the landholder.

The price of land where so much is lying waste, and where [illegible]hould be the interest of government to keep as much as possible of the land occupied, will probably be insignificant in the beginning. Under the present system, borrowed from the ancient Burmese, every part of land occupied or not is the property of government, the natives merely farm it, and pay for the productions raised upon it nominally 25 per cent. ad valorem.

VI. *The greatest variety of articles which can be raised in Tenasserim* is another great advantage which the provinces offer; not only every tropical production thrives well, but also exclusively intertropical articles promise to succeed in the southern parts of Tenasserim, and amongst those, some of the most valuable known, which are confined comparatively to a narrow sphere, such as nutmegs and cloves.

VII. *The combination of agricultural with mercantile pursuits* forms an additional reason to select this part of India in preference to many others. I mean, a planter can combine the sale of valuable spontaneous productions of nature which surround, with his chief pursuits in agriculture.

As the greater part of valuable productions can only be obtained from plants which require several years' growth before they arrive at maturity, the time which intervenes is lost to the planter in expectations, and can be turned to account by converting into practical use the following productions, which to this day are unused, though of intrinsic value, viz.—sticklac, the gamboge, the caoutchouc, the different gum resins, the wood oil, the black varnish, the aloes, and sandal woods, the native dyes, and several tanning substances, &c. &c.

VIII. The last advantage which the provinces offer as a colony, consists in *the facility of getting good labourers;* though the country is thinly peopled, and the Burmese on account of their independence and want of skill will never be extensively used as labourers, yet the Chinese can be brought into the country; it would only be necessary to direct the tide of their emigration from Singapore here, and certainly if Chinese once knew that they could find remunerating employment they would flock of themselves to these shores.

This is a matter of vital importance just at present, when the effects of the emancipation of negro slaves has involved the greatest part of the tropical colonies in embarrassments which threaten some of them with ruin. The advantages of having an European colony would be briefly the following:—

1. It would be the best means of rendering the country in the shortest possible time remunerating. Until now it has been a loss, and though it has made a gradual progress towards the better, yet it will be a considerable time before the native population augments sufficiently to render the country a source of revenue to government. It must besides be kept in mind, that should circumstances ever allow of settled government in Pegu, the greater part of the population in the north will emigrate from Tenasserim and return to their old homes, where they will have protection.

2. European settlers would soon call into practical use the manifold resources of the country.

3. United with the mother country by mutual interest, England would very soon gain by a new commerce with a new country, and by it be benefitted.

4. When grown up to a greater community, an European colony would be considered as a safe position against millions of people inhabiting India. Of the different articles which are found in the provinces, or which can be raised, I have treated in my previous reports, I therefore confine myself to mentioning some of those which promise to become of the first importance to European settlers.

Spices.—Spice cultivation is excluded from India Proper; all attempts to transplant trees from the Malay archipelago have not answered the expectations. When the fruit ripens it is imperfect.

The nobler spices seem to be confined to a narrow sphere in inter-equatorial climes, confined to countries which are not far distant from their native place, the Moluccas.

It is only lately that the spice plantations in Penang (begun under apparently unfavourable auspices) realized the most sanguine expectations of success. They are already, and will be more in time, the true source of prosperity of that small colonial settlement.

Penang has a great resemblance in productions and climate to the southern portions of the Tenasserim Provinces. It may reasonably be conjectured that almost all valuable productions succeeding there will thrive in the Mergui Province. All that hitherto have been tried, have succeeded. Young nutmeg trees are growing in Mergui very well; they are not however sufficiently grown up to know by experience whether they will be equally productive.

There is a practical adage amongst the natives, which I am inclined much to credit, that where mangosteens thrive, nutmegs will grow and bear fruit.

Mangosteens are equally obstinate regarding locality. They do not grow well in India, and produce but indifferent fruit in Ceylon and the southernmost parts of the Peninsula. They do not grow better in the northern parts of Tenasserim; Mergui is the northernmost limit where they attain perfection, and so it probably will be with nutmegs. Should nutmegs bear amply in Tenasserim, their introduction and multiplication will be of the greatest advantage, as no branch of tropical cultivation is as yet known giving such an ample return as nutmegs.

It is probable that the high prices of nutmegs will diminish with the increase of the number of plantations, but even half of the present price would be a very ample return. It is rather doubtful whether clove trees will succeed in Tenasserim; they grow but slowly, and are very delicate. There is only one tree which has blossomed this year, for the first time, in Mergui Province.

Coffee plantations are a branch of tropical agriculture which is particularly well suited for every part of the Tenasserim Provinces. Experience has taught, that coffee plants produce amply, and that the coffee obtained is of a superior quality. Some reared by Major MacFarquhar in Tavoy can be compared with the choicest best in Java. The young trees begin to bear in the third year, and are in full bearing after five years. The virgin soil if cleared, and burnt down forests in valleys on the sloping sides of mountains, are the best suited for its growth. Such an article of the first importance in the European market, does not want a particular recommendation.

Areca palm plantations are also of importance to the European planter in the southern parts of Tenasserim, where they attain high perfection. They give certain returns, which are not inconsiderable; they require however seven years' growth before they produce fruit.

The natives have only since the British occupation laid out areca plantations on a large scale. The provinces do not yet produce sufficient for the consumption of the country, and the nut is imported from Sumatra and Penang.

Should arecas, as lately they have begun, be continued to be transported to Europe for the purpose of superseding oak bark and sumach for tanning purposes, the importance of areca plantations would greatly increase.

Cocoanuts.—In all tropical countries, having a large extent of sea-coast, cocoanut plantations are chiefly remunerating if the native population is accustomed to use these nuts as a part of their diet.

To the European settler they are important, for the sake of manufacturing the oil for exportation to Europe. The country immediately bordering on the sea-shore is that best adapted for cocoanuts, because they require to be somewhat under the influence of salt water to thrive properly, and it is a part of the country otherwise unavailable. The borders of the mangrove jungles can be profitably employed in this way.

Nipah cultivation, though never as yet carried on by Europeans, seems to call for particular attention. The leaves of this palm are used for thatching common houses, when converted into a kind of thatch the price is generally from two to three rupees per thousand. But what merits particular attention, is the making of sugar from Nipah toddy or palm wine. Experiments have shown that the quantity of sugar is greater in proportion to that obtained from sugarcane. The chief difficulty arises from the rapid fermentation which the palm wine undergoes.

Nipah grows only near the sea-shore, in places which are under the influence of the tides; boats therefore can approach within a short distance of the plantation. It would be necessary to have a copper boiler on board of one of the boats, and to boil the just collected juice to prevent the vinous fermentation. In this way a great quantity of sugar could be obtained, which could be disposed of with considerable profit at low prices.

These are the chief perennial plantations which would be the most profitable to European settlers.

Annual plantations are less remunerating, but the returns are quick, and the majority would probably begin with them, except men of capital, who can afford to wait.

Annual plantations however require in the beginning a greater outlay than perennial. We have shown that the country with few exceptions is an uninter-

rupted forest. It is not only necessary with annuals to clear the forests, but to prepare the ground more carefully, digging out the stumps and roots of trees, and rendering it fit for tillage.

Such thoroughly prepared grounds do not exist in the provinces except those destined for rice-plantations, and those being situated in low localities, are scarcely available for other annuals.

It must be ascertained by experience whether a plantation consisting exclusively of annuals would be remunerating to European settlers. It is doubtful whether Tenasserim in its infancy as a colony, will be able to compete with Hindoostan in this respect. If however any annual plantations on a large scale are to be established, then cotton must be counted among the first. To augment the quantity of new cotton in the British colonies, and to render the mother country independent of foreign supplies, ought to be considered a matter of deep concern.

The East Indian possessions are particularly well fitted for cotton growth. India is the mother country of cotton, yet the original plant is deteriorated throughout India, and the modes of cultivation not understood. In Tenasserim the indigenous cotton plant, or that in use, is still worse than the Indian. It has a short staple, want of smoothness, and a great cohesion to the seed. The greater part of the cotton is sown together with mountain rice, upon newly burnt ground. Four-fifths of all cotton grown are obtained in this manner, almost all being used for home consumption. Other cotton seeds have been introduced since the British occupation, but unfortunately Pernambuco cotton was selected and generally distributed. It proved a failure, as might be expected from an almost sub-alpine plant being transferred into sub-equatorial plains, and the failure of the experiments contributed to make the natives think that their own species was better.

Egyptian, Sea Island, and Seychelle cotton have been also introduced lately, but almost all the seeds obtained did not germinate. European settlers well versed in cotton growth would have an ample field for exertions, and it seems that the plains between Ye and Tavey, and between Tavoy and Plalauk, will be particularly fit for the introduction of Sea Island cotton, as that variety likes the atmosphere of the sea and a slightly subsaline soil. For the Georgia Upland plant, the intermediate valleys and slopes would furnish an apparently good locality. We have hitherto, however, no experience whatever of cotton growth with introduced superior qualities, and can therefore throw no light upon the probability of success with cotton.

Of the cultivation of the sugarcane I have spoken in my former reports, as well as of indigo and tobacco cultivation. All these articles grow well in these provinces; there are however no known data on which to base how far an extended well attended cultivation would be remunerating, as these articles have been only reared on a small scale for home consumption, and no care taken to replace deteriorated varieties.

In Hindoostan a great proportion of the land is already converted into fields which are actually under tillage, and the people cultivate indigo, tobacco,

and sugarcane; in this case it seems advisable to unite perennial cultivation with annual.

The following is the sketch of a plantation upon an extensive scale, which seems to the writer to combine all desired profits from cultivation in Tenasserim, and which seems to indicate the most advantageous method under present circumstances, to be pursued for transforming the virgin forest into cultivated land. It is only applicable to the southern parts of Tenasserim, especially Mergui Province. The first operation is the selection of an appropriated locality with reference to soil and situation. The best soil for the purposes which I am about to indicate, is that which has a layer of humus of at least two or three inches depth, whose upper soil is the red clayish earth, intermixed with a moderate quantity of sand.

Localities where the upper surface is constituted of decomposed granite rocks will be found, on account of the fertilizing quantity of the decomposed felspar, highly advantageous. Should a more than ordinary admixture of calcareous substances happen, as is the case in localities where isolated limestone groups protrude, it will be still better, the vegetation in the neighbourhood of such localities being always distinguished by a particularly luxuriant appearance.

It ought also to be ascertained, whether there be a sufficient stratum of subsoil two or three feet thick, not rock.

Undulatory, slightly sloping hills, and of these chiefly the part near the bottom of the valley, will be the best situation.

Places must be avoided where the waters have not a natural outlet, otherwise they accumulate during the height of the monsoon; besides a noxious inundation, the plantations are liable to be carried away with the good earth; the formation of terraces, and the digging up of trenches and drains, would be for the first settlers a too expensive operation, where unlimited quantities of unoccupied land can be chosen in the first instance.

Particular care in the selection of the locality should be taken to establish the plantation not far from the sea coast, from a navigable river, or at least near a creek communicating with the sea, or river, there being no roads in the country, and the easy transport of the produce being a matter of importance.

Localities should be chosen where the forest is high. The more primitive woods are grown up, the more they possess of accumulated humus, and the less they have of underwood;—the more underwood, the less good the soil, and the greater the number of white-ants, the greatest enemies to a plantation in tropical countries.

After having selected the proper locality, the cutting down of the forest is the next operation. It can only be performed during the dry season, from November to April; trees cut down during the monsoon do not burn well, this is a fact of which it is difficult to account satisfactorily.

The great art in cutting consists in felling the trees in such a manner that they fall in heaps; when they are lighted they burn the more freely, for the greatest trouble does not consist in felling a forest, but in burning it.

A month before the setting in of the monsoon, the whole area cut down is burnt in one day; after this, the always considerable remainder of the branches and smaller trees is cut again, and brought on new heaps, which are repeatedly burnt down, until nothing remains but the bare large trunks, which are never consumed by the fire.

In future times, when wood will be more appreciated, part of these trunks, 30 or 40 feet in length, quite straight, some species yielding excellent timber for ship-building and other purposes, will probably be removed to well situated localities, where they can be dragged by elephants to the water's edge. For the present, there is no demand for timber, and these large trunks are left in the plantation to rot. The aspect of such a plantation cleared and prepared, is not agreeable to the eye of an European accustomed to see clean fields; the standing and strewed large trunks present the application of the plough, but in the present description the most profitable mode of plantation is kept in view, and this does not require the plough, for such a plantation is not to become a field, but a garden.

The next aim is to render the prepared soil as productive as a virgin soil can be made. It is not yet ascertained by experience whether it is not advisable to sow in the first instance mountain rice, not only on account of the produce obtained covering at least a great part of the expenses of cutting down the forest, but also on account of being a powerful check to the shooting up of numerous weeds, after a few months, notwithstanding constant weeding. The natives affirm that the quantity of nutritive matter of which the rice deprives the soil, is less than that consumed by the weeds.

If rice is not planted, sesamum oil-seed is sown broad cast upon the ashes, young chilli plants planted in rows, and cut pieces of yams planted like potatoes at intervals.

These annual productions enter into the domestic economy of a tropical planter, and the surplus, if the country be inhabited, is bought up by the natives; the labourers also, in most cases, consent to take a part of their wages in kind, instead of money.

The next is the planting of plantain shoots. This plantation is formed on account of the shade which the broad leaves of this plant throws over the young perennial plants, shade being a most necessary requisite in the dry season, and plantains shooting out the quickest, without detaching much nourishment from the soil, and are besides otherwise useful.

They yield, as is well known, an astonishing quantity of wholesome food. They are cut down after the perennial plantations attain the height of four feet six inches, when they are strong enough to bear the dry season unprotected, and the

burnt plantains yield a considerable quantity of potash. At the same time that the forest is cleared and prepared, a nursery for young areca palms is to be established in some appropriate locality. The best arecas for seeds are to be obtained from December to March, and sufficient are at present grown in the southern provinces, so that seed is always procurable. Such as are the largest and apple shaped, are considered the best for planting. They are placed in baskets in layers, covered with leaves or hay, from 500 to 1000, closely packed together, these baskets are kept in cool places, and watered at least once a day.

The outer husk of the areca nut consisting of fibres and a pulpous matter, begins in a short time to ferment and to decay, the nut loses its bright orange colour, gets dark, and after its epidermis is rotten, it remains enveloped in a mass of closely woven fibres.

The fermentation accompanied with a considerable degree of heat, is deemed necessary to further germinations, which become conspicuous after about one month. In about two months, or later, the nut has shot forth a sprout, about an inch in length. This is the time to take the nuts out of the baskets and to plant them in a nursery, at a span's distance from each other, only half covered with earth. In the latter end of June or beginning of July, they are transplanted into the plantation in the spot where they are to remain for ever. They are then generally one foot high, and have shot two or three leaves in the nursery. They ought to be planted in rows at least seven cubits distant, this being about double of the diameter which the crown of this slender palm occupies, and which is necessary to leave ample room for ventilation. At the time of planting, care must be taken that the weather promises rain for a succession of several days. Should an interval in the monsoon take place, which is generally accompanied by a most powerful sun, the transplanted arecas die or suffer considerably. The arecas are the first of the perennial plantations to be taken care of, and they will be found very advantageous. The profits will not be exorbitant (about four per cent. per annum net gain from one tree), but the planter has the advantage of using the ground without much reference to the arecas, as they derive the greatest quantity of their nourishment from the air.

In the course of time, the palm rises with its roots above the ground, which latter are covered with mammillary varices, constantly removing and absorbing during the night their appropriate nourishment.

The palm does not yield fruit before the seventh year, and continues productive 25 or 30 years. After the first planting no further trouble is requisite than to loosen the ground once or twice a year, without the necessity of manuring or watering, provided the young plants have shade the first and second year.

The next to be done is the planting of coffee. Coffee is not yet introduced in sufficient quantity to have a certain number of seedlings available. Sprouting coffee seed ought to be procured from Calcutta from the coffee reared in Mocha. Young coffee plants can also be obtained from Penang at a very moderate price, and they arrive in good health, the passage being short.

Sprouting coffee must be laid out in a nursery, and the coffee trees transplanted when at least a foot high. No particular care is requisite, except that the roots are sunk vertically in the loosened soil, the slightest curve of the tap root of the coffee producing a sickly tree.

The coffee is to be planted between two rows of arecas, the lateral branches of the coffee extending far, and requiring room for expansion. Between each 1000 arecas 500 coffee trees can be planted without prejudice to the soil, as the coffee tree sinks its roots deep in the ground, and thence derives its nourishment. In the first instance the plantains afford shelter to the coffee, in after years the crowns of the arecas. Areca and coffee being planted, the attention is next to be directed towards the spice trees. It being however problematical whether clove trees will succeed, I confine my observations to nutmegs. Twenty paces apart from each other, holes are to be dug, at least four feet deep and 1½ in diameter, and these are afterwards to be filled with the best procurable earth, such as humus, in preference to cow or buffalo dung mixed with earth, at least a year old, or the best of all, the rotten husk of paddy mixed with earth, yielding a rich vegetable mould, which in the neighbourhood of Burmese towns or villages is always to be obtained.

The nutmeg tree has a tap root descending perpendicularly to a great depth, and which furnishes the chief nourishment. To permit this root an easy penetration downwards, feeding it in the best possible manner, is the reason why these holes are dug.

Considering the very great value of a nutmeg plantation, all the care and necessary outlay are trifling compared with the return. Nutmegs must be procured from Penang. In the Tenasserim Provinces they are scarcely obtainable, and only at an exorbitant price. When the holes are prepared the spice plants are to be transplanted from the nursery, but such only selected which have at least obtained the height of one foot. Each tree separately is to be surrounded with a frame-work of sticks and lateral shades, to be made from nipah palm leaves, the top only loosely covered with leaves, to permit the dew to penetrate, and in the dry season an earthen vessel is to be suspended over the young tree, perforated with holes through which constant moisture is made to drop upon the young plants. All these operations should, if possible, be performed in the first year, to save time.

A careful weeding, if paddy is not planted, is unremittingly necessary the first year, to eradicate all plants the seeds of which germinate very easily in the much loosened and rich soil. There are plants which are particular to newly cleared places belonging to the families of Tiliaceæ (Triumfetta the most common) Malvaceæ, Gramineæ, Convolvolaceæ, &c. &c. which are certain to be found even in the centre of a primitive forest, in cleared places where before, not a specimen of these species could be found for miles in the vicinity. Most of the roots of the burnt down trees shoot again, and must be twice or thrice destroyed before the roots decay.

In the second year, annuals can yet be reared in the intervals between the young trees, chiefly sesamum oil plants, cotton, and indigo; it would however be

detrimental to take from the soil more nourishment in the third year by again planting annuals. By this it will be perceived that a plantation laid out in this way does not yield a return before the seventh year; but that the revenue then increases in such a ratio, if laid out on a somewhat large scale, as to render the planter comfortable and independant after ten years.

The first and second year the settler will scarcely gain more than his livelihood by the value of the annuals; from the third to the seventh, the coffee alone will remunerate him; after the seventh year the arecas begin to bear; and after the eighth begin the crops of nutmegs.

A plantation of 50,000 arecas, 25,000 coffee, and 7,500 nutmeg trees would therefore yield as follows:—

Annuals.

1st and 2nd year, ...	Trifling.
3rd year coffee at an average of two annas net profit from one tree, ...	3,125
4th, 5th, and 6th year, ...	3,125
7th, 8th, and 9th year, arecas at 4 annas per tree, ...	12,500
Coffee,.....	3,125
Total, ...	21,875
10th, and following 7 years, nutmegs at 10 rupees per tree, ...	32,500
Arecas, ...	12,500
	45,000

It must be observed that the calculation is taken from 3,250 instead of 7,500 nutmeg trees, which the colonist originally planted, because half these trees will probably be males, which are useless, and are to be cut down, except one for every twenty females, which is quite sufficient to impregnate them.

It is to be lamented that we know as yet no distinguishing mark to discern a male or female nutmeg tree before they blossom. It is therefore necessary to plant 3,250 young trees more, which after 8 years will again turn out half males and half females, and so it ought to go on, till nothing but females, with a proportionate number of males, are obtained.

It will also be seen, that in the last calculation no notice is taken of the coffee trees.

When however the nutmeg trees grow larger, it will be advisable to cut down the coffee trees, to leave room for the expansion of the first, much more so as the return from coffee is trifling compared with that of nutmegs.

The same is to be observed of arecas, which after twenty-five years begin gradually to produce less; they ought also to be destroyed, to leave nothing but nutmegs, which continue to yield annually more.

Nutmeg trees are said to grow eighty years, and to attain a very large size; we have however no proofs as yet that they will be in these latitudes as lasting as they are in their mother country.

The return of nutmeg plantations increases annually, and in after years is much higher than ten rupees per tree. There are trees in Penang, which yield annually from 30 to 40 dollars, though not yet full grown. They bear almost without intermission throughout the year.

It would be advisable to use the slender stems of the dead arecas for the purpose of training upon them the pepper vine; it is however rather probable, that a planter who gets such an ample return from his nutmeg plantation will not take the trouble of beginning a new mode of cultivation with pepper, which after all does not last more than three or four years.

This now detailed method of cultivation seems the most promising to be followed up in the southern parts of Tenasserim by European settlers, insuring the most solid and ample return of the outlay of the capital, surpassing by far the most ample revenue the sugar plantations in the West Indies ever yielded. Spice is a new branch of tropical agriculture, or rather horticulture, sprung up only in the course of this century; formerly the Dutch government monopolized it exclusively. Penang is hitherto the only British colony which has introduced it, and which begins to astonish the world with the immense profits the owners reap from it. It must however be considered, that only men of some capital are able to begin such plantations, as they must be able to wait at least seven years before they begin to see the profits of their outlay and industry. Formerly nothing was introduced, and nothing cultivated in the provinces, that did not spontaneously occur, except some fruit trees and some of the most common articles of tropical agriculture.

Of American productions, tobacco, pine-apples, guavas, and anotta (bixa orellana) are universally diffused. The durian tree which forms the greatest delicacy among the Burmese, was introduced from the Malay countries, after this came the mangosteen from the same quarter. Though arecas are every where planted in the provinces, they are not extensively planted; and the climate above the 15th degree of latitude seems no more congenial to them. In Mergui province, since the British occupation, plantations, on a large scale, even as much as 10,000 trees, have been laid out by the Burmese, and are augmenting annually.

Mangosteens are a later introduction, and are attended to by the Burmese with great care in Mergui province. Scarcely one-twentieth part of the trees planted are yet bearing.

The Burmese would certainly also plant nutmegs and cloves if they could but procure them. Government would therefore confer a great boon on the natives,

by establishing in the southern parts a nursery of productions from the Malay and other countries, and divide them gratis to a deserving people. A kind of practical botanical establishment, on a small scale, would be highly useful.

In this should also be cultivated many of the wild growing trees, deteriorated in their jungly state, gradually to be domesticated by cultivation, and then exported to other parts, or laid out in experimental plantations. Such are the various kinds of caoutchouc yielding trees, the wild gamboge, the sandal-wood trees, the sassafras, the black varnish, the cajeput-oil tree, &c. &c.

Many plants from the Malay countries when first introduced into Tenasserim, (considering this, as an intermediate stage), could be from hence transplanted to Bengal and Upper India, as it has been generally observed that a gradual acclimation is highly advantageous to the introduction of plants of different latitudes. The establishment of government spice nurseries, would be but following the Dutch system now introduced into Java.

The government monopoly there has been discontinued, and the private establishment of spice plantations encouraged; the government not only promising to supply every person with all plants required, gratis, but also to give instructions and directions how to proceed to ensure success. How much government would gain by such a process, shewing at the same time that the natives are not averse to introduce new modes of cultivation, can easily be illustrated.

Areca plantations are but a new branch of cultivation in the southern parts of Tenasserim. Ten years ago not more than 60,000 trees altogether were planted, the number rose in 1837 to 40,000 bearing trees, and 80,000 newly planted. In the year 1839 about 30,000 more were found. The customary tax due to government upon all produce is 15 per cent.

Suppose that instead of 150,000 areca palms, so many nutmegs were planted, which when bearing yield from 10 to 30 Rs. a tree, each tree taken at 15 Rs. average, the amount of revenue, the government levy, according to the established rule, would be 150,000 Rs. annually from the spice bearing trees alone. Of the necessity of planting out teak forests, I have spoken in my former reports. Without regular new plantations, the teak forests in Tenasserim will soon be exhausted.

One of the greatest riches of the country is derived from its teak forests. Except the teak no other timber is used; a small number of junks annually built by Chinese and other small Burmese craft constructed in Tavoy and Mergui from thingan (hopea odorata) excepted.

The researches carried on this year in the southern parts of the provinces, and amongst the islands, have shewn that this part of the country also is an uninterrupted forest, overgrown with almost the same species of timber which occur in the north. The greatest part of the timber trees valuable for ship-building belonging to the *Dipterocareæ*, and this family has more representatives in Tenasserim than any where else; the *Hopeas*, *Vaticas*, and *Shoreas*, are the most

valuable. The *Dipterocareæ* though attaining an enormous size, furnishes an inferior wood.

All these trees, when full grown, are from 70 to 120 feet in height, rising with a straight trunk 40 or 60 feet high, and have, before they throw out any branches, a circumference from 10 to 30 feet.

Teak having been hitherto procurable, and prejudices being entertained against other species of timber, nobody has as yet endeavoured to turn the immense forests of the provinces into practical use.

So greatly is the timber neglected, that in all Tenasserim not one saw mill is as yet established, and strange to say, planks for house building are transported from Penang. To engage in timber with a prospect of success, would however require a considerable outlay of capital. Either a timber trade should be kept solely in view, or ship-building united with it. Ship-building has started up in Maulmain, is increasing, and is the only branch of enterprise in Tenasserim which occupies Europeans; it is however yet in its infancy, and capable of great extension.

If we except the teak, no other timber trade is carried on. The daily increasing demand for timber in Europe, Bengal, Madras, Mauritius, Cape of Good Hope, &c. however, will not permit the forests of this country to remain long unused. A great advantage towards rendering these forests useful, will be found in the great number of rivers and rivulets whose banks are covered with forest trees, and which will afford great facilities of transport.

Not only the inland parts, but numerous islands of the archipelago of Mergui are covered close to the sea-beach with forests, and frequently it will but be necessary to fell the tree, so as to make it fall into the sea, or to drag it only a few paces to the water's edge.

The establishment of saw mills moved by water, will present great difficulties; the sudden rise during the monsoon is dangerous to the strongest dikes, and it would be less profitable to erect saw mills at a distance from the sea port.

Saw mills propelled by steam at the mouths of the larger rivers, seem to promise the best. The felled trees bound together in rafts could be easily floated down, and by way of the sea, the forest trees from several rivers could be collected at one establishment.

Tin.—In the preceding reports I had the opportunity of speaking about the tin mine to the east of Tavoy, and of the tin found near Mergui. This year having examined the country to the south of Mergui, it was found that the country to the north of the Packchan river is the richest in tin ores of all the districts in Tenasserim. The range of mountains in which the tin ore is found, is a continuation (only divided by the Packchan river) of the Siamese tin territory of Rinowng. The tin is found in the debris of primitive rocks, like in all other parts of Tenasserim, but the grains or crystals are much larger (sometimes of the size of a pigeon's

egg) and the soil in which they are buried, yields 8 to 10 feet of tin; while at Tavoy the utmost is 7 feet. There is also tin at Domel Island in crystals, still included in the granitic matri, and likewise on the banks of the Boukpeen rivulet in its higher part. In fact tin is of a very common occurrence in the southern parts of Tenasserim, and probably its richest deposits are yet unknown.

Persons of capital desirous of engaging in the working of tin, cannot select a better locality than in the southernmost parts of Mergui province. Besides being the richest, almost all land transport is avoided, by colonists establishing themselves on one of the smaller rivers falling into the Packchan.

They would however be obliged to provide themselves with every thing from a distance, for the country is entirely uninhabited, and the labourers must be brought thither from other parts.

Were a village under English protection established somewhere near the Packchan, there is no doubt that a number of Siamese fugitives would settle in the neighbourhood. They have expressed their desire to do so, if hopes of being protected were held out to them. If we consider the value of tin, it seems probable that this product will be one of the first which will attract the attention of Europeans, when it is once known that tin, as it is now ascertained, does really exist in quantities which promise amply to remunerate.

Iron.—All parts of Tenasserim are rich in iron. The localities and species of iron found on the main land, I have described in my former reports, and have only to add, that iron occurs equally upon the islands of the Mergui archipelago.

There have been found by me this year, four great deposits or beds of iron; the first about three hours from Mergui, at Maoin, and probably a continuation of it near Pereghiun; the second not far from the entrance of the Lennya river, at an island called Kala-khiung by the Burmese; the third (the richest) on two islands (no name) to the west of Sir John Malcolm's island; the fourth on White Pigeon's Island, to the north of the Packchan embouchure. The ores if smelted, would furnish from 40 to 60 per cent. of raw iron. The iron of Tavoy remains however the best with reference to per centage (74 to 80 or more) quality; and the preference should therefore be recommended to those who may be inclined to establish iron foundries.

It is to be hoped that such a valuable article, to be had under circumstances where fuel is but a matter of trifling consideration, will attract the attention of enterprising Europeans with capital.

To the mineral articles of the provinces must be added copper, discovered this year in two localities. The first in the NE. part of the great Lampi or Sullivan's Island, found in veins of quartz, running through transition clay slate, the second in the island of Calla-gkiauk, near Mergui, in a quarry running through gneiss.

Both have been obtained, but in small quantities; the prosecution of researches carried on by mining was not intended, but the bare indication of the occurrence of copper will be found sufficient to those who are desirous of turning their attention to this valuable mineral.

Before the invention of the steam engine, and before this invention was brought into universal application as a substitute for human labour for achieving works previously unknown, or thought impracticable, coal was nothing but a cheaper fuel than wood, and only of advantage to countries destitute of forests. In those abounding with timber, coal was useless.

In the same light the discovery of coal would be considered in Tenasserim. The country densely grown with the finest forest (at Mergui 100 billets of wood 9 feet 6 to 10 inches in circumference, are to be got for 9 Rs.) the population extremely scanty, in a primitive state, the country without manufactures and without commerce, the discovery of coal is therefore for the present of no use to the country.

Coal however being indispensable for steam purposes, the discovery of coal becomes highly important to the country indirectly, and to the whole of India directly.

For steamers navigating the coast, and going from Maulmain to Rangoon, Tavoy, and Mergui, coal is no great benefit.

Not above a four days voyage in a steamer can be performed with wood; an eight days trip from Maulmain to Calcutta is impracticable without coal, and the millions of timber trees in Tenasserim could not have contributed any thing to the accomplishment of a steam communication between the different parts of India.

The accomplishment of the Comprehensive Steam System between the different parts of India and Europe, will in a short time render coal in India a matter of first importance, and Mergui coal, of all hitherto known localities of coal deposits in India, will be the first.

The peculiar advantages with reference to quality, quantity, and locality, have been pointed out in my previous reports; it is only necessary to add, that the discovery of a new deposit, almost on the banks of the great Tenasserim river, not requiring land carriage (except a distance of 1000 yards) will cause a considerable diminution in the cost of the article, and will cause still larger quantities to be brought to light than previously would have been perhaps the case.

When Mergui coal is brought into general use, it will exercise a great influence over the other coal fields in India.

The Burdwan coal supply will be limited to the use of steamers on the Ganges and Burhampooter, and in consequence, the prices of coal used in inland navigation will rise to make up for the defect caused by the discontinuance of exportation.

The Palamow, and Cherra-Poongi coal-fields will either be given up entirely, or if they can compete with the Burdwan coal in cheapness, the latter will suffer still more, the quality of the former being superior, and the demand for coal for the river navigation in Hindoostan as yet so limited, that one of these localities can supply all the wants.

The importation of coal from Europe will probably cease entirely in time, for it will be very strange indeed, and only the effect of very bad management, if coal-fields well situated, with a material of a superior quality in the hands of one and the same nation, and many thousands of miles nearer to the place of consumption, should not render India altogether independent of Europe.

The first expense of the opening of the Mergui mines will be considerable, and the prices in the beginning high; either the Burmese must be employed, or a population introduced (Chinese suiting the best). In both cases the wages will be high—Burmese, independent in their character, and provided easily with all the wants of life, and induced only to work for high wages; and Chinese to be introduced into a new country, must in the beginning also be enticed by the prospect of higher wages than they can get elsewhere.

The expense of machinery and the setting it up, will be greater than in any part of India; vessels arriving empty will only carry coal for higher freight, and counting only to be remunerated by the return cargo.

These are the difficulties which will throw themselves in the way the first years, but gradually the coal will become cheaper.

Coal could be turned advantageously to use, by working the mines of iron in the neighbourhood of Mergui with coal; the nearest one is but a few hours distant. Mergui will undoubtedly become a considerable place; colonists ought to be advised to settle in the neighbourhood, and men of capital to resort there in preference.

1. It being that part of the country which possesses the coal mines.

2. It being peculiarly adapted for perennial plantations, and alone fit for the introduction of spices.

3. It being well situated for commercial intercourse overland with Bankouk, and in general with the population scattered along the gulf of Siam, being placed in the narrowest part of the Malay Peninsula.

Besides the rich mines of the country, there is also antimony, silver, and gold, in the country, which are, however, to men of capital of minor importance.

Antimony will perhaps be worked, if Maulmain continues to be a flourishing settlement, on account of its neighbourhood to that place. The silver mine to the north of Maulmain is too engirded by the mountains, and its value as yet too

problematical to recommend it to private enterprise; and gold is to be found in too small quantities in the rivers to merit attention.

The fisheries are not unimportant, as may be well expected in a country which possesses 600 miles of sea-coast; but they are the most considerable amongst the islands of the archipelago of Mergui, where the young brood find an appropriate shelter between the inner islands. In the month of February and March, the sea is covered for miles with a green mucilaginous mass, which envelopes myriads of spawn; the variety of fish is great, and Mergui is famous for the most delicate species.

The fisheries are farmed out to the natives; Malays and Chinese share in this occupation, but it is carried on on a very diminutive scale.

During some periods of the year the fishermen retire to certain spots on the uninhabited islands to the south of Mergui. It is however, done very imperfectly; the fish is spread over a framework of mangrove trees, and permitted to dry in the sun, being daily trodden with the feet twice. No salt is ever employed in the curing of fish. Certain kinds of fish are bought in the market smoked.

They have small and imperfect nets, these being sufficient to get the quantity desired near the towns and villages; fish are caught in stakes.

Some little fish oil is also collected. It seems that a fishery carried on by Europeans, on a similar scale with that of Newfoundland, would be much more remunerating, as a ready market here and in India will always be found, cured fish forming an universally relished condiment and ingredient of the native dishes. It must be remarked that whales are not [illegible] in the Mergui archipelago. There are pearl banks to the south of Mergui; [illegible] were worked once at the time of the Siamese occupation; one situated on the east side of Sullivan's Island, the other on the east side of *Collie* (?) Island, stretching across to the main. This occupation is said to have formed a considerable source of revenue to the government.

Once an attempt was made by Mr. Maingy, the Commissioner, to revive the pearl fishery, but it was given up for want of divers accustomed to dive to great depths, the best pearl shell-fish being found at the depth of ten or twelve fathoms. This source of revenue lies entirely dormant at present. The natives are ignorant of the necessary proceedings.

Sometimes pearls of a middling quality are found by the Seelongs in the indicated localities at low water, and these bartered to the Chinese who traffic with the remnants of that race. How far it would be remunerating to men of capital to engage in this pursuit, can of course not be said at present, as even the extent of the pearl banks is not known, as well as the quantity obtainable from shell-fish attached to rocks at a greater depth.

The edible birds' nest caves form a not inconsiderable source of revenue to the provinces in the southern parts of the Tenasserim Provinces.

They are at present farmed out to Chinese and Malays; those in the Mergui archipelago are again farmed out to other Malays, who come from Penang during the dry season to watch the caves, and to build and repair the frameworks necessary for collecting the bird's nests attached in the sombre caves, on the most lofty, dangerous, and inaccessible parts. This branch of occupation it seems does not suit Europeans, and will probably remain for ever in the hands of Chinese and Malays. Irregularities will occur as long as the localities which the swallows frequent are not ascertained, which is the more difficult as these birds change their abodes; so that many caves (such for instance in the Elephant rocks to the S[illegible] Domel) are now almost entirely deserted.

To these productions of the sea, which enter into the article of commerce, must be added tortoise shells, mother o'pearl shells, sea-slugs, and amber, which are found among the islands of the Mergui archipelago, and which are entirely neglected, or triflingly collected by the wandering Seelongs.

Commerce.—For commercial men (Europeans) the Tenasserim provinces are a poor resort.—In a new country it requires a long time before a regular commercial intercourse can be established, whereas in Tenasserim reciprocity is wanted.

The Burmese have been too long separated from India, and much more from Europe; they know little of the commodities of either country, and they know not how to use them. What they want for their own comforts, and do not produce themselves, is all found within the sphere of their own country; what Tenasserim does not produce of their luxuries, superfluities, or commodities, Pegu and Ava do. Very few articles of European or Indian produce have found their way to Burmah. These few articles are limited to cotton piece goods of an inferior quality, some broad cloth, iron, tobacco, and opium; and the majority still use their own homespun cloths, and content themselves with inferior tobacco, while only a small portion of the community (chiefly the richer class) indulge in smoking opium. All the rest of the commodities imported is for the use of foreigners in the provinces, and these being comparatively few, their wants are soon satisfied.

The generality of the Burmese people have no inducement to become acquainted with foreign commodities, they are too widely different in their habits, customs, and wants, from Europeans, and they possess as yet no ambition to procure the new luxuries; they have besides no reason to exchange their surplus for new articles. Yet Burmah in general, and Tenasserim considered as a part of it, might be a country of commercial importance, possessing many articles instrinsically of value, which would be appreciated in European markets, and which require only to be collected, being partly the spontaneous productions of nature, which are now entirely unused, and will remain so as long as there exists no mutual commerce. Even supposing that the natives could be induced to collect these articles at a reasonable price, vessels that would arrive to carry away that produce have nothing to bring, and consequently their profits would be doubtful. Under such circumstances, trade will only be confined to Asiatics, who are much better fitted to provide the natives with the little commodities they are in want of from foreign parts.

Should the provinces become a resort of civilized men, whose wants are more numerous, and with whom commodities are become by force of habit necessities, then commerce will spring up, and the resources of the country, the spontaneous productions of nature, as well as the produce of the cultivated soil, will be called forth in a short time.

The Tenasserim Provinces are well situated to become a commercial emporium; they could be made the intermediate link, uniting the Chinese world with India and Europe.

An overland communication between China and the British Indian possessions has long time been deemed very desirable. From two points there is a possibility of accomplishing it, either by way of Assam, or by way of Tenasserim. Though Assam is much nearer to the Chinese dependencies, yet the nature of the country to be traversed seems to throw such difficulties in the way, that it is not thought of at present. Maulmain is much more distant from China Proper, but there are, as far as is known, no great natural difficulties to overcome, to establish a commercial road at least with Chinese Yunan, the southernmost province. The Chinese themselves seem to be desirous that it were accomplished, and the fact that a Chinese caravan was actually on the road to Maulmain, corroborates this opinion.

The difficulties are only of a political nature, and are to be sought for in the jealousy of the Burmese and Siamese governments, and the apprehensions of the Shan states, to the north of Amherst Province. Should the relations with Burmah be placed on a solid footing, there is no doubt that an overland trade with China and the British Indian possessions would spring up. Chinese caravans come annually to Burmah, and within a short distance of the northern parts of Tenasserim.

The articles most in demand, would be European and Indian goods of little bulk, such as opium, piece goods, cotton yarn, and bullion, and they could be sent into the interior parts of China in this way more direct than at present, for all articles imported by British vessels must be from the sea ports to the distant inland provinces of China; and though it seems at first sight to be a very long journey from Maulmain to China, yet it is a shorter one for the western provinces of Yunan, Mungfan Kahang, and Amdoa, than through Canton; and several of these, which are unable at present to get these goods at all, could be provided with them in this way.

If the Chinese import from Burmah now almost nothing but raw cotton of an inferior quality, which is very bulky, how much more would they be inclined to transport the above mentioned articles.

The Russians set an example in their trade with China; their communication embraces the longest known commercial overland road—from Astracan over great part of Siberia, to Kaichta, from whence they have to pass the Duary Mongolian steppes, before they reach the great wall, the entrance to China Proper.

The distance from Maulmain to the southern parts of China is trifling, compared with the Russo-Chinese road of commerce. The southern parts of Tenasserim are well situated to carry on a commerce with Bankouk. The British intercourse with Siam has been greatly neglected, which is the more to be wondered at, as that country abounds in most precious articles, and its ruler seems to patronize commerce. The treaty concluded with Siam does not preclude British Indian subjects from trading overland; there has been however hitherto no inducement to do so. Mergui would be the place to carry on a trade across the isthmus, which in a straight line does not there exceed eighty miles, thirty at least of which, as far as is known, can be accomplished by water on this side. The country does not present any great difficulties, and a road formerly existed from Tenasserim across the country, which Alompra followed with his army, marching to besiege Bankouk. Should such a road be opened again, it would call into operation the coal mines discovered last year—which are situated on this road, not far from the Siamese frontier, which for the present remains unused—as the late discovered locality of coal presents far greater facilities for transport.

Should the Tenasserim Provinces advance in prosperity, it is very probable that the gulf of Siam will be united with the bay of Bengal by a railroad. To form a canal through the isthmus of Kraw, as has been once proposed, would rather appear a chimerical undertaking. I had opportunities of examining that portion of the country this year, navigating the Packchan river as far as it is navigable for vessels of some burthen, and the natives informed me that an interruption exists in the range of mountains, which runs through the peninsula, and that another navigable river (Telim-foung) is met with at a distance of six hours march on the other side; but whatever localities might be chosen to traverse the peninsula, a rail-road in a tract of country abounding with timber, iron, and coal, would at any rate be preferable to a canal.

For the present such an undertaking must remain a theoretic scheme; it would only be recommendable in the event of Tenasserim being occupied by European settlers; the relations with Siam, as a country full of resources, better understood; and the commercial intercourse with China not only re-established, but also become more vigorous, and still more extensive. In the latter case a speedy communication between China, India, and Europe, and across the peninsula, through Tenasserim, would be very beneficial.

Recapitulation.—Recapitulating what has been said in the foregoing pages, we are led to the following conclusions.

1. That Tenasserim is particularly well situated for an European colony, on account of the quantity of good land unoccupied, the variety of tropical productions which can be raised, the salubrity of the climate, and the facility of communication, possessing a large extent of sea-coast with numerous navigable rivers.

2. That the natives will be no impediment in any way to European settlers, as they are in many respects in Hindoostan.

3. That Tenasserim therefore ought, in preference to any other part of British India, to be chosen as a resort for Europeans who are desirous of occupying the land as agricultural settlers.

4. That it possesses, besides, great inducements to men of capital to employ their money productively here; the timber forests, the tin, iron, and coal mines, besides other spontaneous productions of nature, being inexhaustible riches of value.

5. That mercantile speculations cannot be remunerating at present, there being scarcely any demand for foreign produce.

6. That the situation of the country is such, as to point it out as the commercial high road in the north between China; and in the south, between Siam and British India.

NOTE.—The MS. from which this valuable report was printed abounds with copyist's errors, on which it has been sometimes impossible to venture even a conjectural correction.

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